NEWS IN PERSPECTIVE

JULY 15, 1961

MANAGEMENT VIEW

WITH EVEN GREATER UNITY and with even greater awareness of national problems affecting us--this is the way "we may have to act in the very near future, recent developments in the national capital indicate," EEI convention delegates were warned by the new Institute Pres. Philip A. Fleger in his acceptance remarks. He expressed confidence that "we can overcome a new and greatly intensified campaign of the proponents of government power..." Said Philip Sporn: "I do not believe it is possible to have any effective influence in Washington if one stays away from Washington." Investor-owned utility leaders don't stay away from Washington for long--example: on last night of annual convention a special delegation hurried to the capital to oppose the Administration's plan for making the Hanford reactor dual-purpose.

UNWANTED MANHATTAN DARKNESS, next-day dilemma for ConEdison (host utility for the big EEI annual meeting) had repercussions on utility company PR across the nation. Other metropolitan systems responded in confident, but cautious comment. Said Philadelphia Elect.: The company anticipated this trend (to a new 2.7-million kw record demand) and was prepared for the sudden demand for power ...(but) it is physically impossible for anyone to forecast accidents or the contingencies that could occur with man-made equipment... And, in Chicago, Commonwealth Edison Spokesman Tom Ayres described for The Chicago Tribune the intricate provisions his company has for maintaining uninterrupted service, asked a reporter to avoid implying that it couldn't happen here.

PUBLIC POWER "SOCIALISM" in Utah would be foreign to the state's pioneering traditions and will do nothing to promote the economic welfare of our people, Wm. A. Dawson (former Rep. from Utah) recently told a Congressional subcommittee in opposing federally built transmission lines for the Upper Colorado River Storage Project. He spoke on behalf of the Utah Bankers Assoc.; while a representative of the Utah Mfrs. Assoc., R. G. Derrick, speaking for consumers of 40-percent of the power used in the state, also backed private power: "Our state and nation need the tax revenue private transmission lines would bring..."

ECONOMIC CLIMATE

INFLATION FEARS are decried by Administration economic advisers. Only the Federal Reserve Board makes no secret of its concern lest the wage-price spiral once again gets out of hand. But other policy-makers seem fully convinced that the general condition of the economy is anti-inflationary. Even the impending federal deficit tends to be heavily discounted as a potential inflationary factor. Even if deficits for each of the next two fiscal years approach $6-billion, it is said, their total would be less than the $12.5-billion in red ink that was recorded in 1959--and this did not touch a match to the inflationary powder train.

ENCOURAGING SIGNS in the economy continue to multiply. Some increase in capital spending plans by business has been noted. Even if this accelerates a trifle, capital outlays for 1961 will fall about 3-percent under '60.

Groundwork is being laid for a new upsurge in final demand for big-ticket goods and services, says NICB's Martin R. Gainsbrugh. He notes that the economy gives every promise of again rebounding from a recession to even higher levels of output and employment than were achieved at the previous peak.

WASHINGTON INFLUENCE

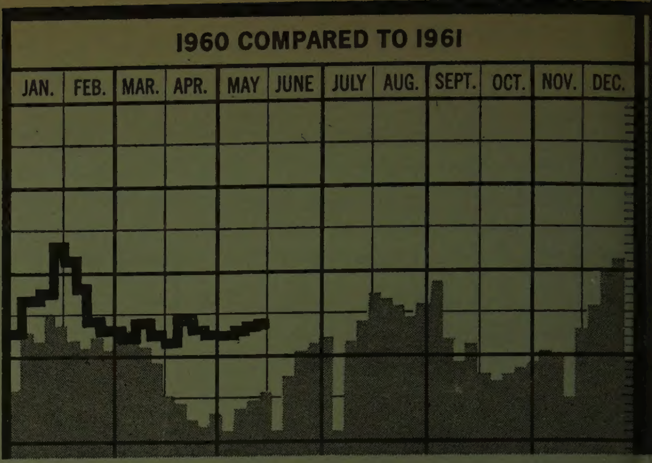
"FRUIT OF THE NEW FRONTIER" was what REA Administrator Clapp called the largest REA loan ever made--$60 million for G&T to a group of 16 Indiana co-ops (Hoosier Cooperative Energy, Inc.) who first applied for the loan in 1957. No action was taken on the loan request during the Eisenhower Administration; the loan was strongly opposed by investor-owned utilities. With enough G&T loans, co-ops hope to reduce their power costs by $5.5-million over the next decade, or almost nine percent. (Ahead: A buildup of G&T loans--see p. 55.)

SL-1 REACTOR ACCIDENT last January in Idaho--of great interest to utility safety and PR people as a test situation --might have been prevented, if measures had been taken to correct "any number of deficiencies in: (a) design, test and operation; (b) organization, training and administration; and/or (c) procedures, policies and standards. An AEC-appointed board of investigation, in a report last month, listed these among preventive measures which may have avoided the incident (first fatal one in the history of U. S. reactor operation): (1) positive limitation of central control rod withdrawal; (2) more extensive administrative controls, independent of the operational organization and (3) better communications betweeen levels of operating organization.

REACTOR SAFETY FINDING with the granting of an AEC construction permit is not necessary, says the Supreme Court in overruling the U. S. Court of Appeals in PRDC v. IUE. With Justices Douglas and Black dissenting, the High Court said it was clear that "Congress contemplated a step-by-step procedure." The majority opinion also gave "particular weight" to the discussions of procedure between AEC and JCAE. The Court said the builder accepted the risk with his eyes open, but the dissenters argued that the investment of many millions would place the "momentum on the side of the applicant, not on the side of the public." (The case, involving the Fermi fast breeder reactor, was the first contested licensing procedure to be decided under the 1954 Atomic Energy Act.)

INDUSTRY SIFTINGS

REPORT OF HIGHER PRICES for electrical equipment, a "trend" noted by many utility companies, is only partly supported by recent announcements from the manufacturers (as in the case of price hikes by General Electric on power capacitor equipment). In other instances, manufacturers have reappraised production and marketing costs and prices, raised some and lowered others (example: Line Material Industries--prices for overall anchor line is down 4.2-percent, for single-suspension insulators, up 3.95-percent). But, Lapp Insulator offered a "temporary" reduction via a quantity pricing plan for suspension insulators, noting that lower prices "result solely from a softness of the market."



SUMMER CLIMB TO PEAK began in May (above, from EL&P's Electr Utility Barometer), when industry's weekly production headed towar 15-billion kwh. In June, record demand on some systems offered clue big margin by which '61 summer peak load would top '60's peak 132.8-million kw. . . . and, maybe, '60's winter peak load—133. million kw.

SPOT ON LIGHTING--From the Floodlighting Institute: a first project involving distribution of a new promotio kit of materials on lighting for buildings, monuments and churches; from Reader's Digest: word that its annual street lighting contest awards for General Federation of Women's Clubs are being stepped up tenfold in 1962 to help combat crime, delinquency and accidents; from Commonwealth Edison: a report on first large-scale lighting plan of its type in Chicago--a block-lighting project attracting participation from over 90-percent of homeowners to improve exterior house lighting; and from the president of I.E.S., R. G. Slauer, who predicted last month that continued research for better indoor lighting migh some day "move outdoors indoors."

CODED MOBILE RADIO CONTROL of switched capacitors, "a rather novel and inexpensive system" being used by a Maryland utility, raised a question re the application of FCC regulations, whic neither prohibited nor specifically permitted this use of radio. But, recently Eastern Shore P.S. Co. received full clearance for the setup--see p. 62.

That's why Hi-F is a new design that's made up only of time-proved "components." The cap-head-and-pin design is that of the Lapp No. 6605 6" dead-end insulator, which is time-proved by more than 30 years of successful and distinguished service (and which, with an M & E rating of 10,000 lbs., has routinely been testing at 16,000 to 19,000 lbs.).

Because the cap of Lapp Hi-F is 1" smaller in diameter than that of the 15,000-lb. standard unit, identical electrical characteristics are provided by a shell that also is 1" smaller in diameter.

Design of Lapp Hi-F, then, is a *combination* rather than an *innovation*. All components are of time-proved design; Lapp's progress in manufacturing techniques, control and material quality, permit their combination in the first "functional design" suspension insulator in more than a generation.

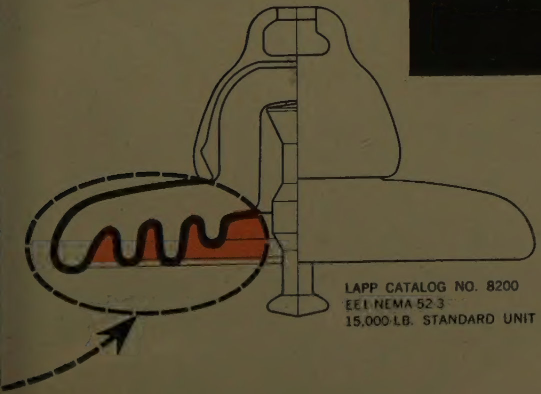
HOW ECONOMICAL?

Designed for "normal duty" transmission lines—and not extravagantly over-designed—Lapp Hi-F carries a substantially lower price than the conventional 10" insulator. Weighing about one-third less, it costs less to handle in the field, offers a smaller target for stones and bullets, and may be worked more easily with hot-line tools. Fairly priced at $2.50 (in 24,000 lb. lots), Lapp Hi-F offers economy to the user, at a price that affords fair profit to the manufacturer. Sample units are now available.

WHERE CAN Hi-F BE USED?

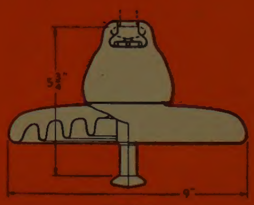
Lapp Hi-F provides an adequate safety factor for any suspension use up to a working load of 7,000 lbs. It is ideally suited to all substation and sub-transmission dead-ending. It is within the loading range of practically all wood-pole construction, as well as that of light or medium-weight steel tower lines—at any voltage. Even at the upper end of the strength scale, Hi-F will often be found to be adequate for use in the suspension position, with high-strength 10" discs used for dead-ends.

Lapp

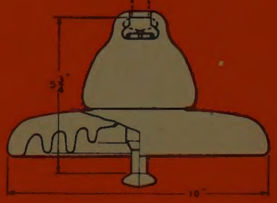


LAPP CATALOG NO. 8200
EEI-NEMA 52-3
15,000-LB. STANDARD UNIT

ONLY FROM LAPP Hi-F



9000



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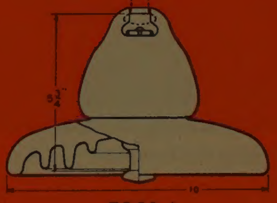
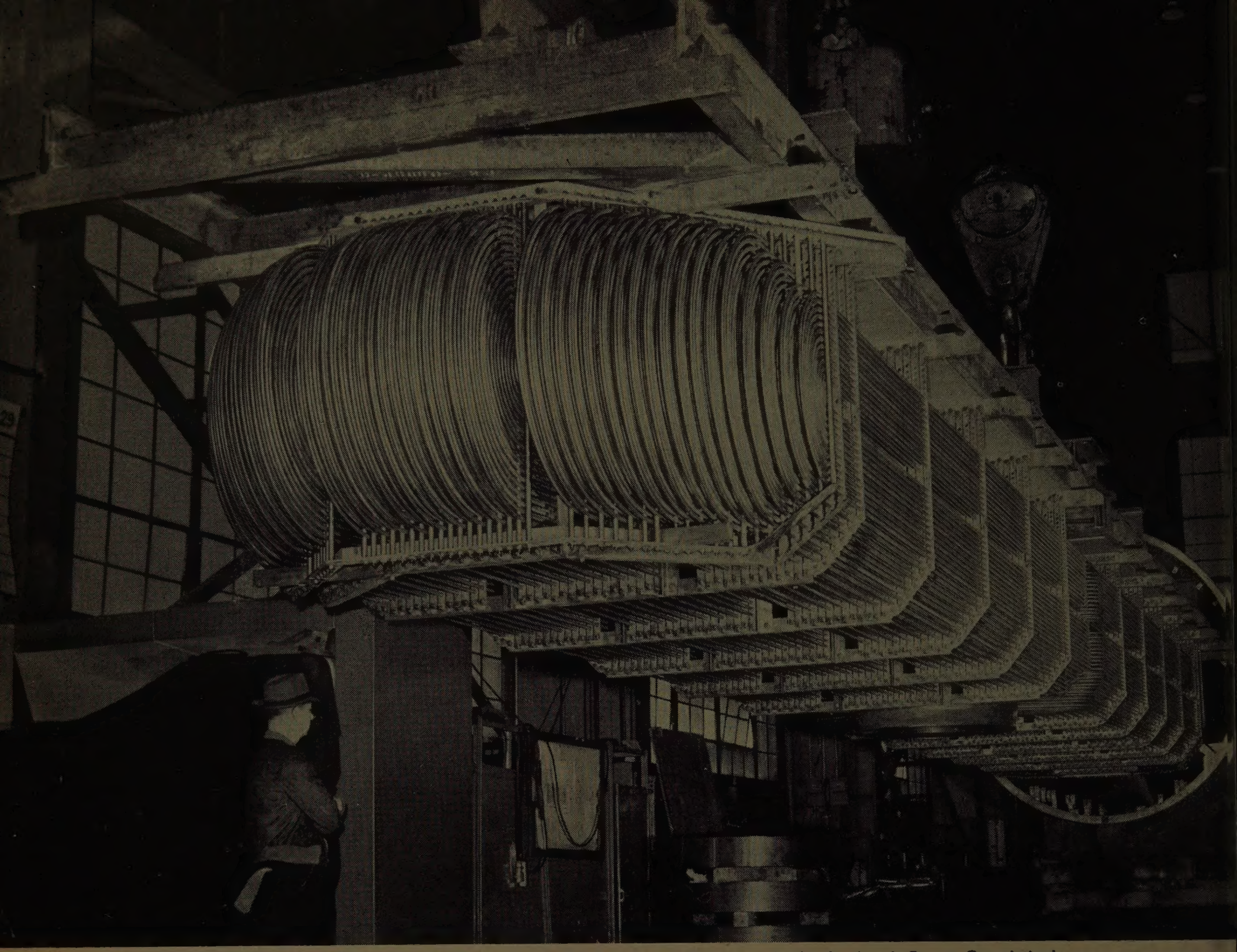


5960 A

Another insulator choice to help you specify what you need and pay only for what you require

Catalog Number	Hi-F 9000	8200	5960A
EEI-NEMA Class		52-3	52-5
DIMENSIONS			
Leakage Distance, Inches	11.5	11.5	11
Dry Arcing Distance, Inches	7.75	7.75	7.75
MECHANICAL VALUES			
Combined M&E Strength, Pounds	14,000	15,000	25,000
Impact Strength, Inch Pounds	55	55	60
Routine Proof Test Load, Pounds	7,000	6,000	10,000
Time Load Value, Pounds	10,000	10,000	15,000
ELECTRICAL VALUES			
Low Frequency Dry Flashover, kv	80	80	80
Low Frequency Wet Flashover, kv	50	50	50
Impulse Flashover—Positive, kv	125	125	125
Impulse Flashover—Negative, kv	130	130	130
Low Frequency Puncture Voltage, kv	110	110	110
RADIO INFLUENCE VOLTAGE DATA			
Test Voltage—Rms to Ground, kv	10	10	10
Maximum RIV—Microvolts at 1000 kc	50	50	50
PACKING AND SHIPPING DATA			
Net Weight, Each, Pounds	7.4	11	13.5
Packed Weight, Each, Pounds	7.75	12	15
Standard Package	6	6	6
PRICE			
24,000 lb. Shipments	$2.50	$2.92	$3.70
Less 24,000 lb.	2.60	3.05	3.85

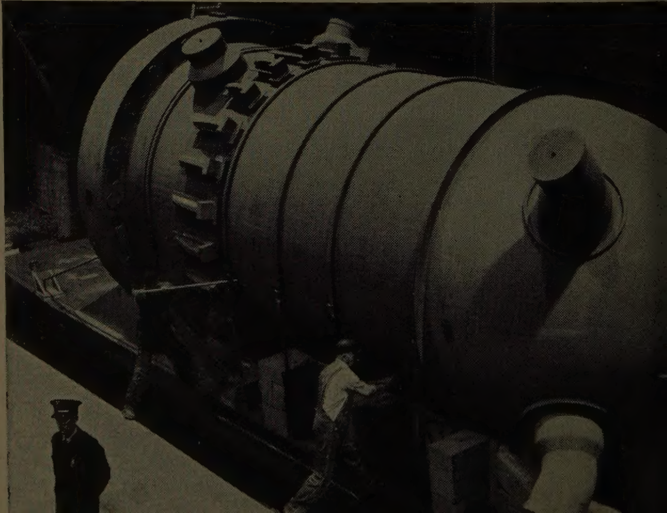


This steam generator, being assembled in a C-E shop, is one of ten on order for the Atomic Energy Commission's New Production Reactor, Hanford Works, Richland, Washington. Designed and built by C-E, each generator is 10 feet in diameter, 57 feet long, weighs 170 tons and contains 20 miles of stainless steel tubing. (See below.)

Designed and Built b

Loaded aboard a special, heavy duty flatcar, a completed steam generator begins its trip to Hanford (see photo and caption above). If all ten units are used to generate power, Hanford will be the world's largest nuclear power plant with a capacity of about 700,000 KW.

The reactor vessel for the country's first commercial (PWR) nuclear pow plant is shown here prior to its trip to Shippingport. This 250 ton, 8⅜-inc thick vessel was designed and built by C-E.



The steam generators and reactor vessels pictured here re representative of Combustion's ability to serve the uclear field in the design and manufacture of heavy uclear components.

But C-E experience in this area is not limited to the nits illustrated. For instance, current C-E work includes he design of the reactor vessel for Italy's first commercial oiling Water Reactor (SENN); the design and fabrication of the reactor vessel for the 50 emw BWR for the onsumer Power Company's Big Rock Point Plant; the esign and fabrication of the reactor vessel for the world's rgest PWR, the 375 emw plant of Southern California dison Company. The "Southern Cal" vessel will weigh-in t about 450 tons, will stand 43 feet high, will be 10¼ nches thick and will have a diameter, over flanges, of bout 15 feet.

In addition to this work for the electric utility industry, C-E has been a major component supplier to the U.S. Navy, having designed and built reactor vessels for number of nuclear powered submarines, the Aircraft arrier Enterprise, the Cruiser Long Beach, and the Frigate Bainbridge.

C-E has the personnel, the facilities and the know-how o design and build components of all kinds. It specializes n those which are large, heavy or thick—those which equire a high degree of finish—those which are extremely omplex—those made of stainless steel or special alloys -or those which must be surgically clean or optically flat.

C-E heavy duty dock loading facilities, adjacent to he plant on the Tennessee River, allow the economical hipment by water of very heavy components (in excess f 400 tons). All coastal points and many inland cities an be reached via the inland waterway system and without clearance restrictions.

For further information, write to your nearest C-E ffice or to Nuclear Component Sales in Windsor, Conn.

Combustion

ATOMIC POWER DEVELOPMENT ASSOCIATES
APDA Fast Breeder Nuclear Reactor Vessel
Enrico Fermi Atomic Power Plant
COMBUSTION ENGINEERING

Made entirely of stainless steel, this reactor vessel is part of the Liquid Sodium Cooled, 100 emw, Fast Breeder Reactor system of the Atomic Power Development Associates at Lagoona Beach, Michigan. One of the most complex vessels ever built, it weighs about 380 tons, including its rotating plug. It was designed and built by C-E.

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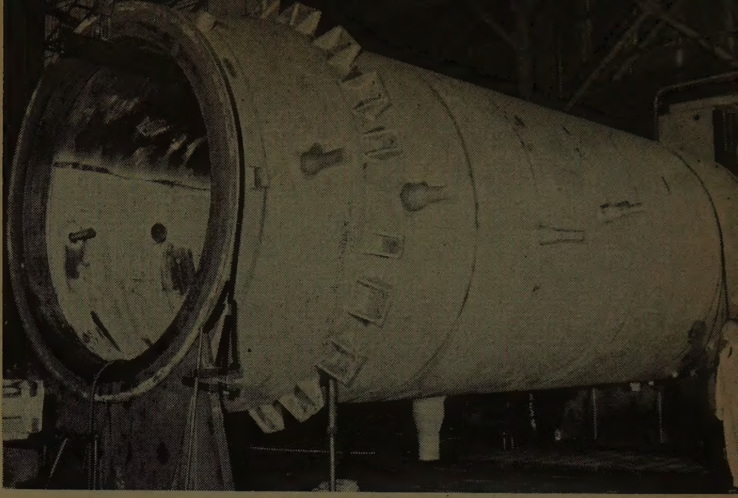
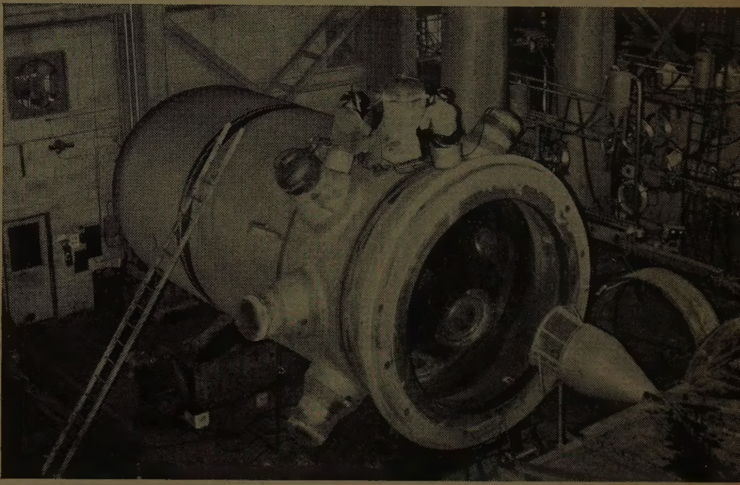
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



Reactor vessel for Pacific Gas and Electric Company's 50 emw Boiling Water Reactor Plant at Humboldt Bay. This 140 ton vessel is 10 feet in diameter and 42 feet long. It was designed and is being built by C-E.



Hydro caps being welded to the nozzles of the reactor vessel for the 180 emw Pressurized Water Reactor for SELNI (Societa Elettronucleare Italiana) in Italy. This vessel, designed and built by C-E, has a shell thickness of 9⅝-inches and weighs 285 tons.

EEI Convention Panel . . .

Financing: Never Simple—Expert Advice Is Varied

Experts, such as those on the panel which discussed "Financing the Industry's Construction Program" for the EEI annual convention, are seldom in agreement, Moderator Chas. B. Delafield commented at the outset. But, the presentation helped to demonstrate that the industry wants all the help it can get in doing a financing job that is never very simple.

If there was one objective that was stressed most in the discussion perhaps it was the desirability of maintaining "flexibility." Chas. C. Glavin, vice-president of the First Boston Corp., and Edward B. White, vice-president of the National City Bank of N. Y., especially emphasized this aim.

Said Mr. Glavin: "To meet the problems and to seize the opportunities there must be flexibility in financial thinking and in practice. Virtually all companies in your industry today have achieved a financial soundness sufficient to permit flexibility in selection of financing media.

"Flexibility in timing is equally important. Do your financing as you need the money. Proper use of bank lines gives you some flexibility in this regard, partly to avoid issues of uneconomic size and partly to avoid going out in storms. But the most important thing is being in position to act quickly.

"It is, in my opinion, highly desirable that you keep within management discretion the selection of the best method of sale at a given time. To the extent that you are subject to regulatory requirements for competitive bidding, you should fight to convince regulatory authorities that all interests are best served by an open mind. A second area is freedom of choice to meet market conditions. Not infrequently an issue will require special selling efforts and in such case a negotiated sale will inevitably be better than a sale at a bidding," observed Mr. Glavin.

Said Mr. White: "The availability of interim or term credit from commercial banks has a very tangible value because of the great flexibility in loan arrangements. As loan demands increase in an upswing in the business cycle and/or seasonal swings, banks are 'loaned up' and can get only temporary relief from the Federal Reserve Banks. Competition for a dwindling supply of available loan funds becomes extremely keen from all kinds of business.

"It is at times such as these that a fair and logical method must be used to correlate available loan funds with borrowers' needs for credit. The compensatory balance record provides such a guide. Usually the demand for bank credit at this juncture is aggravated by unsettled conditions in the long-term market which emphasizes the advantages of flexibility in timing of security issues which bank credit affords.

"But, keeping compensatory balances costs money, so, most utility companies, as a matter of prudent management, have operated with minimum cash, often insufficient to maintain compensatory balances with their banks. In the tight-money periods, some public utilities have found it difficult to obtain necessary bank credit to provide for normal requirements. Forced trips to the capital markets at a time of severe unsettlement were the alternative. As we emerge from the current recession there is every reason to believe that we shall again experience periods of tighter money.

"Regulatory commissions should take a further look at the real function of compensatory balances. It seems illogical that commissions should penalize a utility company by ignoring the cost of compensatory bank balances which, in the final analysis, is pay for services rendered to help make utility operation more efficient," suggested Mr. White.

Frank D. Chutter, industry specialist for Massachusetts Investors Trust suggested that all electric utilities have the potential of selling at materially higher prices. Mr. Chutter noted that the investor is willing to pay a premium equal to 180 times the assumed annual increase in earnings. He commented:

"Certainly, this prize is a big enough reward to challenge the best efforts and imagination of managements. If any management adopts such a goal and sincerely tries to reach it, there will be renewed vigor and excitement in every department —especially if you have a stock option plan."

Wm. A. Doyle financial writer for the "New York World-Telegram & Sun" and author of the "Daily Investor" column, reported that most utility stockholders are "happy".

"We must continue to spread stock ownership," he warned, suggesting: "Shouldn't you lean toward stock offerings as much as possible—as a matter of corporate advancement and, perhaps, even self-preservation?"

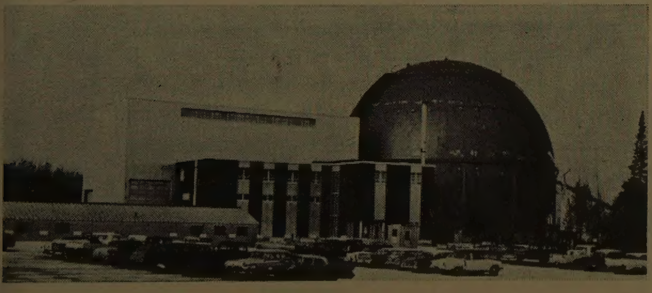
This panel of specialists in the field of finance addressed the recent EEI annual convention (l to r): G. W. McKinney, Jr., F. D. Chutter, C. B. Delafield (moderator), E. B. White, C. C. Gavin and W. A. Doyle.

FUEL STORAGE AND DISPOSAL—Latest developments in this area of nuclear power facilities operations includes these actions: (1) The AEC made its first financial arrangement with a licensee for the return (to NRTS in Idaho) of spent fuel elements leased from the government, contracting with GE for fuel elements used in the company's Vallecitos Boiling Water Reactor; and (2) The state of New York announced plans to set up a 3500-acre nuclear service center in Western N. Y. to provide for the temporary and long-term storage of atomic energy fuels, by-products and wastes, along with related industrial development—first non-federal service center in U. S.

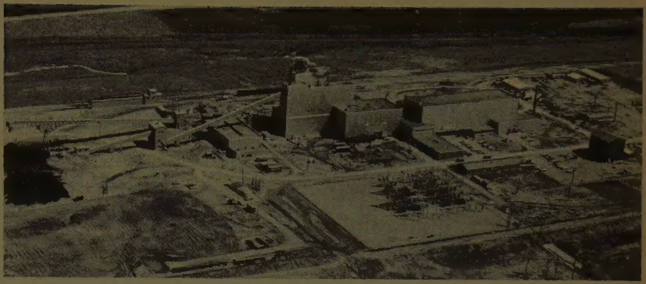
AEC LICENSE APPLICANTS will soon be expected to notify local officials at the time applications for reactor or waste disposal licenses are filed, if a proposed procedural revision is adopted. This would assure the earliest possible notification and avoid any delay in such notification such as may now occur under the procedure where the AEC is informing local authorities after applications are received.

"BETTER BALANCED PRICES" for uranium are in effect, according to the AEC, with the recent reduction in the Commission's base charges for enriched and depleted uranium, with the net effect of "lowering the cost of nuclear power." Commented AEC Chairman Seaborg: "It also brings into better balance the AEC's charges for enriched uranium compared with current market prices of natural uranium . . . these changes tending to reduce distortion of technology and economics regarding the use of enriched versus natural uranium in power reactors." (Addressing the EEI annual convention, Maj. Gen. Nichols, former AEC Gen. Mgr., proposed that each January a price for U_{235} be established for the ensuing fiscal year based on the actual cost of production for the current year; and that the AEC should at that time announce the price to be paid for plutonium for fuel and military use for the ensuing fiscal year.)

FUEL ELEMENT REPROCESSING is being attacked as a cooperative research project by Allis-Chalmers and Italy's Committee for Nuclear Energy, it is reported. A $4-million reprocessing facility is being built in southern Italy to handle spent fuel elements from the Elk River, Minn., reactor (supplied by A-C) . . . "to demonstrate the feasibility and problems of reprocessing thorium fuel elements."



Consumers Power Co.'s Big Rock Pt. Nuclear Station, under construction, will be first to use high power density nuclear core.



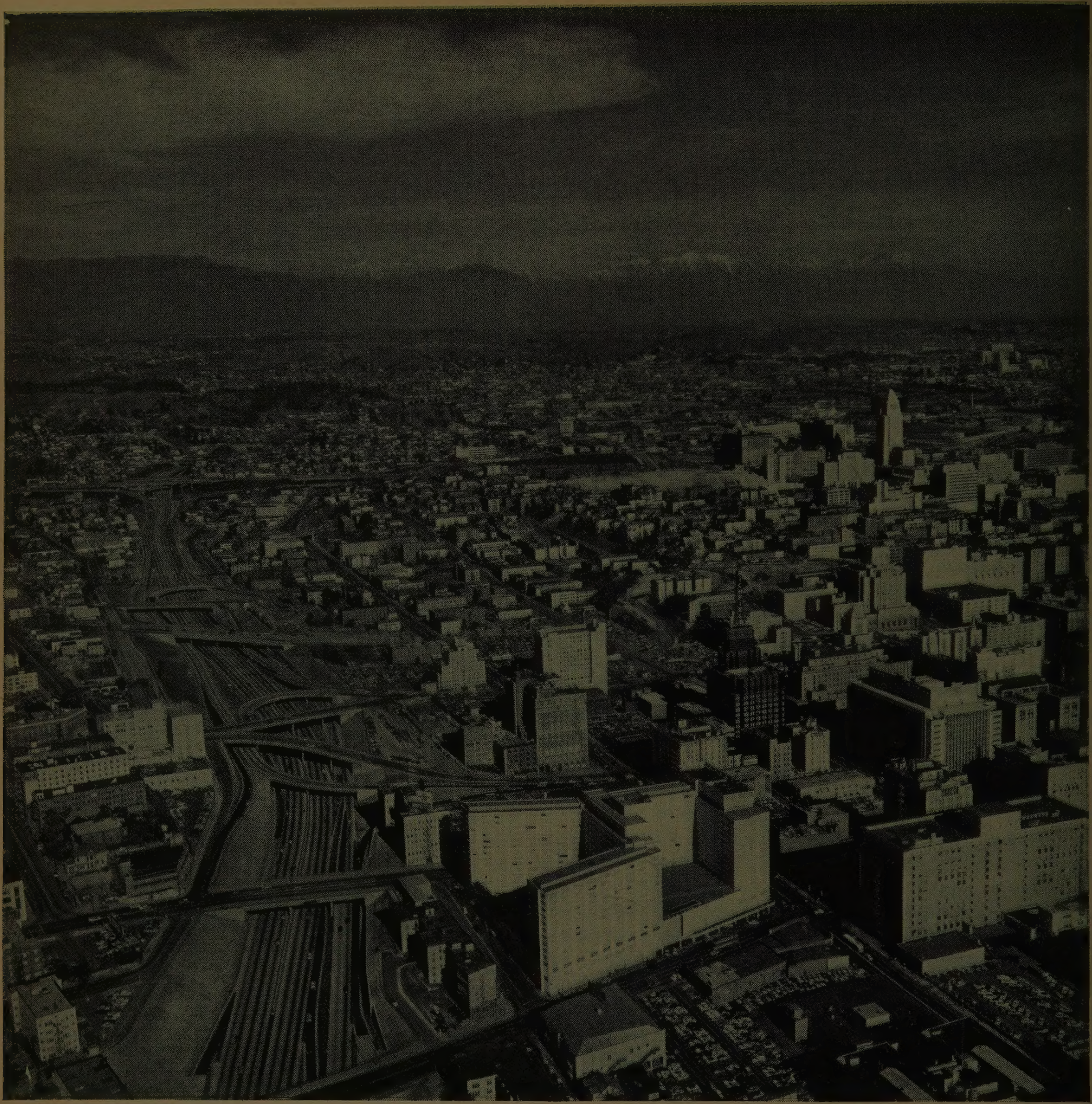
CPPD's Sheldon Station, a $50-million, 100-kw nuclear powerplant, is nearly completed. After an extensive testing program, the plant will go into operation in '62. Reactor building is at right in photo.

EXTRUSION OF URANIUM OXIDES is another development goal of Allis-Chalmers, under contract with the AEC and the Electric Auto-Lite Co. They seek a commercially practical method for preparing nuclear ceramic fuel bodies by extrusion rather than by such methods as pelletizing. Results to date: Most standard grades of UO_2 can be extruded and fired to the desired density and dimensions, some without pre-processing. Best densifier studied is TiO_2, best inorganic plasticizer is Bentonite. Work continues on measuring the straightness of extrusions, and on determination of the maximum practical length of extruded and fired pieces that can be mass-produced.

NATIONWIDE COOPERATION IN RESEARCH—this is the "new dimension" which the national laboratories have added in "playing a role that is unique," AEC Commissioner Haworth told the American Nuclear Society last month. He added: "I believe firmly in their future destiny. It is their responsibility to look for new and promising and often speculative goals. It is they who should take the long chances looking for big payoffs in the end. Thus, they form a spectrum and a bridge reaching from the most fundamental science to the threshold of industrial application. They have been and should remain a most vital element in the national program in atomic energy."

LA CROSSE (WIS.) BWR, a 50,000-kw concept employing forced circulation and internal steam separation, is to be built under the AEC's Power Demonstration Reactor Program. To be finished in 1964, the plant will be operated on the Genoa, Wis., site of the Dairyland Power Cooperative of La Crosse, Wis. Reactor builder is to be Allis-Chalmers, under a $10.8-million contract. Dairyland will buy steam output of the reactor.

OVERALL EFFICIENCY OF 40-PERCENT is indicated for large-scale high-temperature, gas-cooled reactors of 300-megawatt size using re-heat steam cycles, predicts Dr. Peter Fortescue, chief research and development engineer for General Dynamics.



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SALES OFFICES:

WASHINGTON OUTLOOK

BY RALPH ELLIOTT
WASHINGTON EDITOR

New REA Policy Spells Boost For Public Power

In keeping with the New Frontier's policy of promoting broader public ownership in the electric utility field, REA Administrator Norman Clapp has, by administrative fiat, brushed aside traditional restrictions against REA financing of generation and transmission facilities.

Unless Congress steps in and overrules Clapp's action's the likely result will be a substantial build-up of G&T loans which could dangerously accelerate the public power movement. For under the new policy REA could approve this type of loan without regard to the availability or price of power from an alternative source.

Heretofore, in accordance with assurances given Congress in 1936 by sponsors of the original REA Act, the agency's policy has been that G&T loans would be made only under two conditions: *(1)* Where no adequate and dependable source of power is available to meet the consumers' needs; or *(2)* Where the rates offered by existing power sources would result in a higher cost of power for the consumers than the cost from facilities financed by REA.

Clapp's third criterion, announced last month: "Where generation and transmission facilities are necessary to protect the security and effectiveness of REA-financed systems." Obviously this could be stretched in just about any desired direction under any conditions. Certainly it is broad enough to wipe out the other two criteria or to defeat their purpose, which was to prohibit the needless establishment of non-taxpaying, federally subsidized power systems in competition with taxpaying electric utilities.

Perhaps the clearest indication of the real significance of the new criterion has come from Clapp himself. In a speech to a co-op group in Oklahoma last April he promised that the G&T policy would be broadened sufficiently "to guarantee the cooperative device a permanent place in the American power industry."

Of more than passing interest was the strong anti-utility flavoring which Clapp poured into speeches made last month to co-op meetings in New Mexico and Wisconsin, where he announced the actual adoption of Criterion No. 3. He warned that power company suppliers are "more interested in profits than in service to rural people," and seek to "encroach" upon co-op territory. He reassured the co-ops, however, that REA not only has eased the G&T loan policy, but has set up a Power Supply Division "to study your wholesale power supply problems, and to work with you in putting together G&T proposals that will guarantee your cooperatives a proud and secure status in the Nation's power network."

Incidentally, another announcement made by Clapp was that REA, in order to help co-ops "encourage new production and service businesses" would broaden the use of Section 5 loans (originally intended for financing farm wiring, and appliance and plumbing installations). Thus, he said, "you will be able to extend this kind of financing to the purchase and installation of electric-powered machines and equipment in factories and commercial establishments in your service areas."

A danger signal regarding the direction in which REA is moving was flashed to Congress during House debate last month on the Agriculture appropriation bill, which carries $195-million of new electric loan funds for REA in fiscal 1962. Rep. Robert Michel (R-Ind.) condemned REA's new G&T criterion as "back-door lawmaking," and insisted there is nothing in REA's entire legislative history "that could be interpreted in any sense of the word to make G&T loans to guarantee the cooperative device a permanent place in the American power industry." Contending that such major policy changes should be made by Congress and not by agency action, he added: "This so-called third criterion—when considered in connection with the subsidy to REA through the use of 2-percent money and freedom from federal taxation—might possibly have the effect of not merely securing 'a permanent place in the American power industry,' but of taking it over completely."

Rep. Donald Bruce (R.-Ind) told the House that "If Congress sits complacently by and allows bureaucrats to pervert the body of existing law to suit their own questionable ends, then we might as well close up shop and go home."

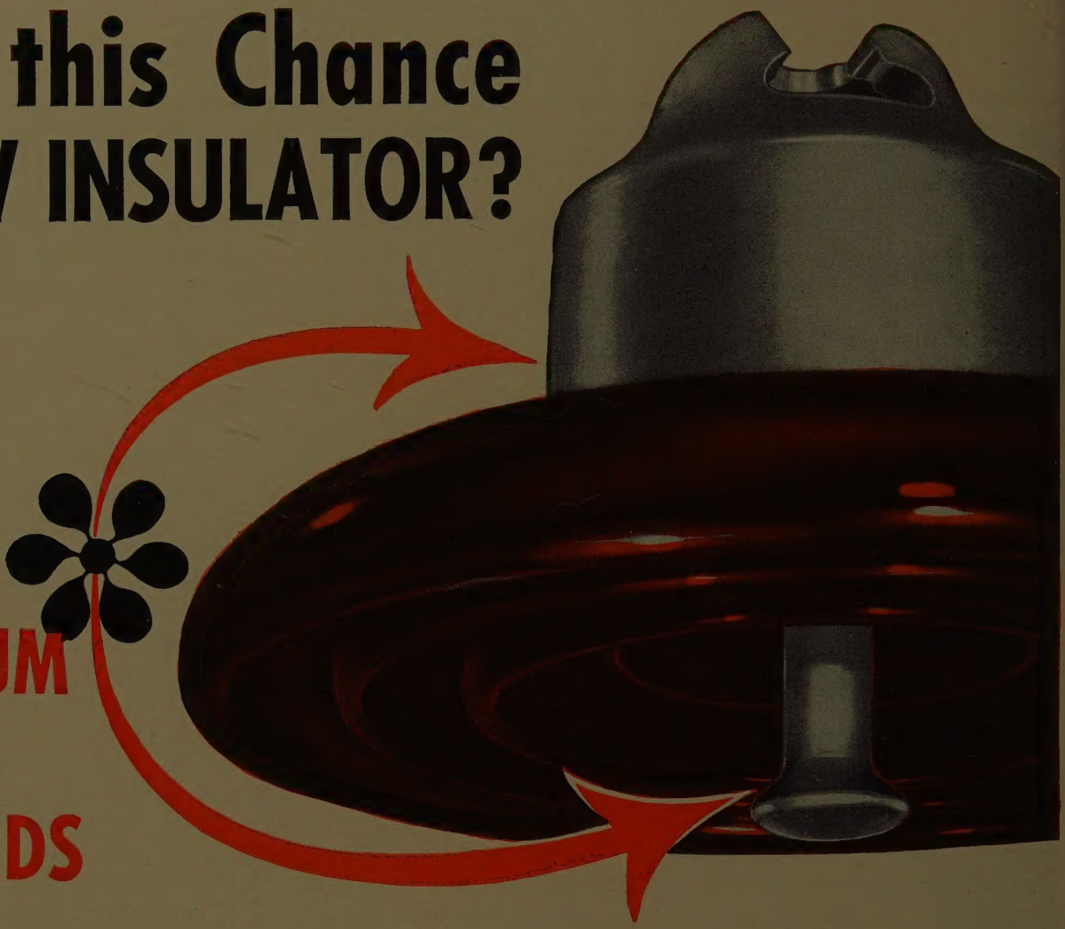
As to broadening the use of Section 5 loans, Bruce charged that "REA is now getting completely away from the original purpose of the Act and is becoming what might be termed a rural power company. And these rural power companies will use 2 percent money and the other subsidies we are giving them to lure industry right out of your towns and cities."

Another far-reaching potential of the new G&T policy was echoed in recent remarks by Interior Assistant Secretary Kenneth Holum before the Missouri Basin Inter-Agency Committee. He said Interior is studying the integration of thermal and hydro power in the Basin to determine how preference customer loads will be met after 1955. The amount and kinds of energy Interior will have available after that date, he noted, will depend upon plans worked out with "the consumer-owned utilities" and the federal agencies, including REA. He said Interior's studies will also determine differences in the future federal transmission system "which may occur as a result of various locations of future steam generating plants."

The significance of this is clearer when viewed along with such developments as the announced intention of a federation of co-ops, operating in five Basin states, to ask REA for $114-million to finance 400,000-kw of thermal capacity.

Surely the handwriting is on the wall. The question now is, how long will it take Congress to wake up to what the New Frontier is aiming at.

WHAT'S NEW* about this Chance 10" EHV INSULATOR?



***ALUMINUM CAPS AND STUDS**

Save over two pounds in weight A Chance 10 inch insulator with forged aluminum hardware is at least two pounds (usually 2½ lbs.) lighter than any ordinary 10 inch suspension insulator. That adds up to 64-plus pounds saved on a 230 KV, 16 double-string deadend. Consequently Chance aluminum-fitted insulator strings are easier to handle, transport, and install.

Provide better corrosion resistance The forged aluminum alloy hardware effectively resists corrosion. This has been thoroughly proved in use on the highly successful 66160 Chance distribution insulator. The stud is *fully* supported in the body of the insulator . . . corrosion is not intercepted; it is eliminated. The cotter key is stainless steel.

Dissipate heat to reduce porcelain damage Because the aluminum hardware is an excellent conductor, these 10 inch insulators provide the advantage of fast heat dissipation during faults or surges. The porcelain insulator is not subjected to thermal shock damage.

MANY TESTS PROVE THAT CHANCE 10 INCH EHV INSULATORS CAN SERVE YOU BETTER

These new aluminum fitted insulators are completely tested to prove their ability to give many years of unfailing service on your lines. Tests include 60 cycle wet and dry flashover tests; positive and negative impulse flashover tests (1½ x 40); steep wave front tests (8000 KV per micro-second rise); high fault current tests; vibration tests; special extended-time load tests; oil puncture, radio noise influence, thermal shock and all standard mechanical and electrical tests. For more information, contact your Chance ServiCenter or insulator representative.

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A. B. CHANCE CO.
CENTRALIA, MISSOURI
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CI 61-16A

ENGINEERING-OPERATIONS

Tester Watches Meters—Electronically

An electronic test unit for all types of single-phase meters recently was put into service by Public Service of Colorado's Electric Meter dept. in Denver.

An operator has to set only four buttons and dials to control the General Electric Co. machine, which calculates the percent of accuracy of a meter at both full and light loads. The percentage figure then is transferred automtaically to tape on a calculator next to the tester.

The machine has been added to the department's testing equipment and will not replace any of the four manually operated test boards, which handle both single- and three-phase meters.

Consolidated Edison Installs Aluminum Roof-Top Substation

A roof-mounted, all-aluminum 138-kv substation, weighing approximately 78,000 lbs is expected to be in service Feb. 1962, on Consolidated Edison system.

Equipment for the unique station was designed by G-E's High Voltage Switchgear Department in Philadelphia, Pa. Because of the low-profile requirements of the installation, horizontal air-break switches are being used.

Motorola Introduces Noise Suppressor For Two-Way Radios

A means of suppressing ignition noise interference caused from vehicle electrical systems has been developed by Motorola for extending the operating range of two-way radio systems and providing more reliable reception in heavy traffic areas. Known as "Extender" operation, the device eliminates impulse interference from the radio-equipped vehicle and all other vehicles in the vicinity.

Ignition noises are automatically detected in the early stages of the radio receiver. Extender operation "turns off" the mobile receiver for the 2-3 microsecond duration of each ignition impulse. Since it takes hundreds of microseconds to transmit a single vowel, quieting the receiver for the impulse duration does not affect the clarity of the message. Extender operation effectively increases radio coverage area by knocking out ignition noise interference that would ordinarily override the message in a weak signal area.

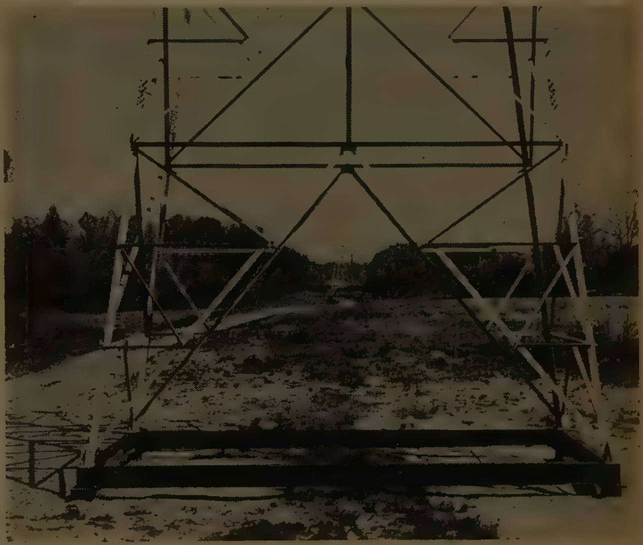
An added feature of the new Extender model radios is the rejection of intermodulation and desensitization. The interfering signals may come from other two-way radio systems, AM, FM or television broadcast stations. A three position switch on the radio control head enables users to select automatic ignition noise suppression, intermodulation rejection, or standard receiver operation.

Stone & Webster Develops New Tower Foundation

Stone & Webster engineers have developed a new and cheaper way to anchor electric transmission towers in slack soil. In some instances, the technique can cut tower foundation costs in half, S&W revealed.

The process was developed for G-E's Project EHV prototype transmission system near Pittsfield, Mass. (For details on Project EHV see *Electric Light & Power* 1/15/61-p. 48.)

Loose, sandy soils encountered at places along the path of EHV's transmission line, on the banks of the Housatonic River, raised severe construction problems requiring arduous studies of soil resistance. S&W found that a single vertical pile under each tower leg, when linked to the others by a four-cornered steel frame, would provide sturdy underpinning in soils requiring driven piles.



Single vertical piles under each tower leg, linked by a steel frame, anchor this transmission tower in loose, sandy soil. Stone & Webster engineers created the new type of foundation for General Electric's EHV project on the Housatonic River at Pittsfield, Mass.

Conventional design of the tower foundations would have involved driving two or more piles under each tower leg, then capping each set of pilings with concrete. But the unique design developed by S&W required no concrete caps or so-called "batter" piles, to resist horizontal stress.

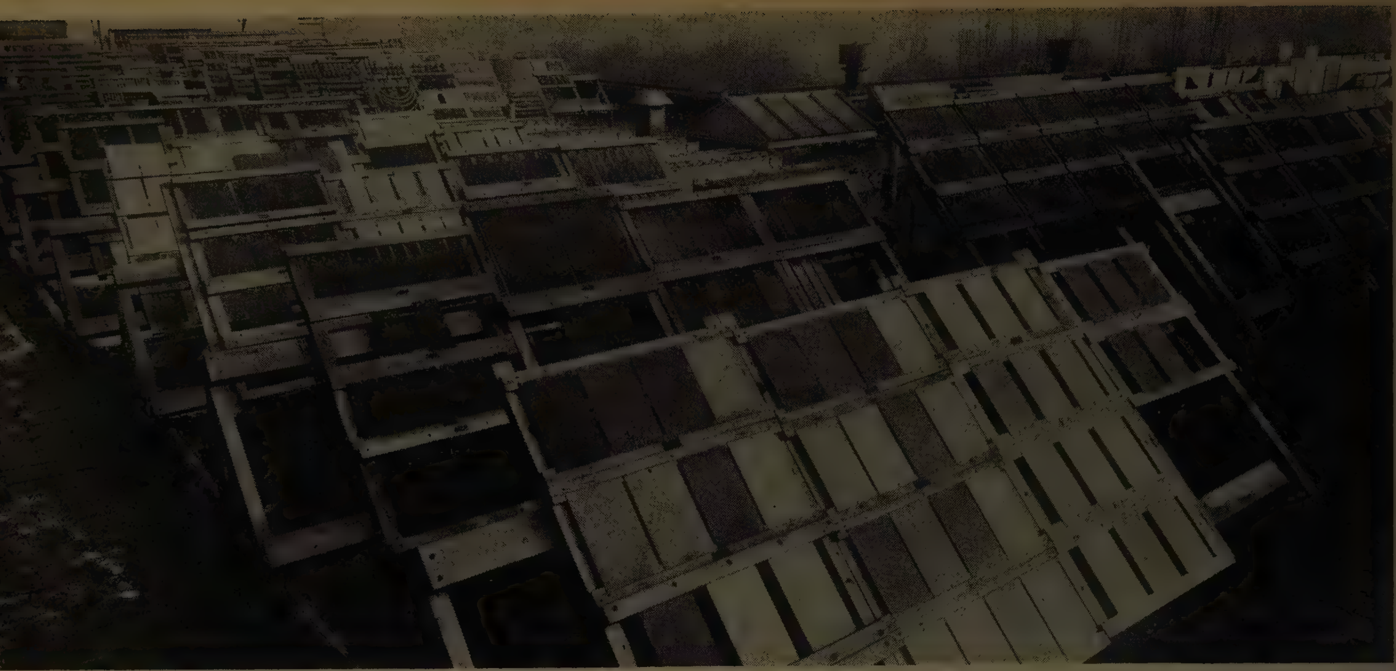


Fig. 1—View of the exposure station located on the roof of the Alcoa Research Laboratories at New Kensington, Pennsylvania. Testing here involves not only exposure to the severe industrial atmosphere of the city but also to fumes emanating from the chemical exhaust hoods of the Laboratories.

ALUMINIZED STEEL CORE WIRE IMPROVES ACSR PERFORMANCE

Data obtained from 43-month exposure to salt mist and fogs at P. G. & E.'s Jenner Test Site have confirmed superiority of aluminized steel core wire in ACSR over hot-dipped galvanized or electrogalvanized steel core wire.

By J. E. HALL(1) and E. T. ENGLEHART(2)

AS A RESULT of cooperative efforts between Alcoa and certain wire manufacturing companies, a hot-dipped aluminum-coated (aluminized) steel wire product has been developed that is highly satisfactory for use as core wire in ACSR.

The potentialities of combining the high resistance to corrosion of aluminum with the strength of steel in the form of a coated steel product had been recognized before the turn of the century. Unfortunately, difficulties in fabrication techniques, particularly with respect to continuity, uniformity, and thickness of coating, have prevented such products from reaching the expected high level of performance until recently.

ACSR containing galvanized steel core wire has generally performed satisfactorily for more than half a century but it has been evident from scattered reports that the resistance to corrosion of even this product could be improved. The use of a good quality, hot-dipped aluminum-coated steel core wire would accomplish this objective.

Aluminum generally possesses a higher inherent resistance to atmospheric corrosion than does zinc. The margin of this basic difference

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(1) Chemical Metallurgy Division, Alcoa Research Laboratories.
(2) Assistant Chief, Chemical Metallurgy Division, Alcoa Research Laboratories, New Kensington, Pennsylvania.

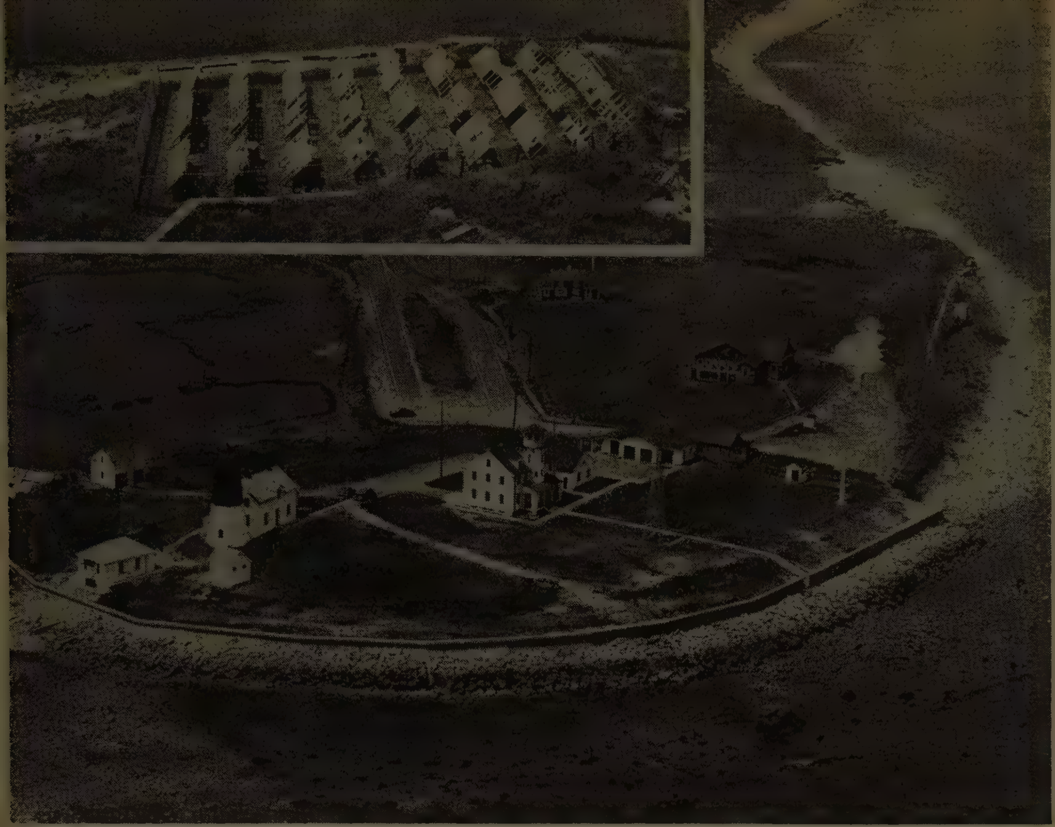


Fig. 2 — Aerial view and close-up (inset) of Alcoa's seacoast exposure station at Point Judith, Rhode Island. Located along a stony beach and about 300 feet from the water's edge, this station faces the prevailing winds from the ocean. Considerable salt mist is usually present in the air. (Aerial photo — courtesy of Providence, Rhode Island, *Sunday Journal*.)

is increased in ACSR, for the life of the aluminum coating on the core wire is not decreased by contact with the aluminum conductor strands. In contrast, the zinc on galvanized core wire can corrode sacrificially to protect the aluminum strands. In addition, the aluminum coating will not sacrifice itself as rapidly as zinc in protecting any exposed areas of steel core wire. Thus, by extending the life of the coating of the core wire, the performance of the conductor strands is also improved since a longer period elapses before they are committed to electrochemically protecting any exposed steel on the core wire.

In order to assist reaching the objective of improving ACSR by using aluminized steel core wire, Alcoa installed a pilot coating line in 1947. As a result of this research and development, an improved ACSR product employing hot-dipped aluminum-coated steel is now a reality.

Published information on the performance of aluminized steel core wire in ACSR has heretofore been limited to two articles. The first(1) indicated, after one year exposures at five various sites, better performance for No. 4 ACSR 6/1 containing aluminized core wire, Class C Elec-

TABLE I

PERFORMANCE OF NO. 2 ACSR 6/1 COMPONENTS FOLLOWING AN EXPOSURE OF ONE YEAR TO 3½% INTERMITTENT SODIUM CHLORIDE SPRAY

Conductor Identification		Steel Core Wire			EC Strands
Coating On Steel Core Wire	Additional Core Protection	% Coating Weight Remaining[1]	Max. Attack Into Steel Core, Inches	% Change in Tensile Strength[1]	% Change in Tensile Strength[1]
Aluminized	None	92	None	—2	—10
Hot-dipped galvanized	None	7	0.0007	—2	—23
"B" Electrogalvanized	None	12	0.0007	—2	—24
"C" Electrogalvanized	None	21	None	—3	—28
Aluminized	Compound A	98	None	0	0
Hot-dipped galvanized	Compound A	17	0.0056	—2	—49

Notes: (1) Based on original properties of representative, unexposed samples of conductor.

TABLE II

TYPICAL DATA OBTAINED FROM AN EXPOSURE OF 43 MONTHS OF NO. 2 ACSR 6/1 CONDUCTORS TO THE ATMOSPHERE AT P.G. & E.'S JENNER TEST SITE

Conductor Identification		Steel Core Wire			EC Strands	
Coating On Steel Core Wire	Additional Core Protection	% Coating Weight Remaining (1)	Max. Attack Into Steel Core, Inches	% Change in Tensile Strength(1)	% Change in Tensile Strength(1)	% Change in Conductivity (1)
Aluminized	None	84	None	0	—11	—0.1
Hot-dipped galvanized	None	15	0.0003	—1	—24	—4.0
"B" Electrogalvanized	None	2	0.0007	—4	—10	—0.7
"C" Electrogalvanized	None	26	0.0004	—4	—10	—0.4
Aluminized	Compound A	97	None	0	— 8	0.1
Hot-dipped galvanized	Compound A	14	0.0008	—1	—28	Not determined

Notes: (1) As compared with original properties of typical, unexposed conductor samples.

Fig. 3—Test span (in foreground) of conductors exposed at P. G. & E.'s Jenner Test Site. Span is situated about 100 feet above and 400 feet inland from the rocky shore line of the Pacific Ocean. (Photograph — courtesy of P. G. & E.)

trogalvanized core wire, or grease-protected hot-dipped galvanized core wire than for the No. 4 ACSR 6/1 containing hot-dipped galvanized core wire.

The second article(2) mentioned the satisfactory performance of aluminized steel core wire in No. 4 ACSR 6/1 after eight years' service at Alcoa's Massena, New York plant. The aluminized coating on this wire remained bright with only scattered specks of rust staining. Further examination revealed no significant attack of the steel core and virtually no loss of aluminized coating during the eight years.

Test Environments

As a part of a continuing Alcoa program to evaluate methods of improving the resistance to corrosion of all products including ACSR, aluminized steel core wire has been evaluated as a component of No. 2 ACSR 6/1 in two accelerated laboratory corrosion tests and in four natural atmospheric exposures.

The laboratory tests consisting of exposures to salt spray (3½% intermittent) and to high humidity (100% relative humidity at 125°F) have been completed, whereas the atmospheric exposures in the industrial atmosphere at New Kensington, Pennsylvania, and in three marine atmospheres at Point Judith, Rhode Island; Point Comfort, Texas; and Pacific Gas and Electric's Jenner Test Site, California, are continuing. The corrosivities of the atmospheres at New Kensington and Point Judith have previously been established(3,4).

The New Kensington test station (Fig. 1) is situated on the roof of the Alcoa Research Laboratories where fumes emanating from chemical exhaust hoods supplement the severe industrial atmosphere of that city. Of the three seacoast stations, the two located along the East and West coasts are the more aggressive. The former, at Point Judith, Rhode Island (Fig. 2) is established only 300 feet from the water's edge, whereas the latter, at Jenner, California, (Fig. 3), is located about 100 feet above and 400 feet inland from the shore line. Since the coast is rocky and prevailing winds are from the ocean at each location, ample opportunity exists for test specimens to be wet with salt mist and fogs. At Point Comfort, Texas, the specimens were exposed 70 feet from the water's edge, facing Lavaca Bay.

Test Materials

Besides the previously mentioned aluminized core wire, other metallic coatings in No. 2 ACSR 6/1 were simultaneously tested so that the relative merits of each could be ascertained. These additional core wires included hot-dipped galvanized, Class B Electrogalvanized, and Class C Electrogalvanized. A commonly-used proprietary grease, hereafter designated as Compound A, was applied to comparable lots of the aluminized and the galvanized core wire prior to stranding the No. 2 ACSR 6/1.

To obtain an indication of the effect of the various coated steel core wires on the aluminum strands, test lengths of No. 2 all-aluminum (7-strand) conductor were exposed as controls. Many other factors relative to the performance of ACSR were also evaluated in this particular test, but they are beyond the scope of this article.

All steel core wires were plant-produced materials, with the aluminized coating being an aluminum-silicon alloy.

Test Procedures

The tensile properties of the aluminum strands and the core wires, the electrical conductivity of the aluminum strands, and the core wire coating thickness and weight were determined on representative portions before and on the test specimens after exposure. The data obtained before exposure showed conformance to pertinent ASTM standards as they exist today. After the scheduled exposure periods were attained, the conductor samples were photographed, visually examined, and in addition to determining the aforementioned strand and core wire properties, the depths of attack were measured. Adhering corrosion products were analyzed in some instances.

The length of the conductor samples varied. For example, approximately 100-ft spans of the conductors were strung between poles at P.G. & E.'s Jenner Test Site; these test spans were energized (2300 volts). In the other exposures, relatively small lengths were exposed statically and non-energized.

Test Results

The salt spray, (see Table I), and high humidity tests predicted a superior performance for the ACSR containing aluminized core wire. This prediction has been borne out by the results subsequently obtained, for the No. 2 ACSR 6/1 with aluminized steel core wire has withstood all four atmospheric exposures very well.

With regard to its performance as compared to that of the hot-dipped galvanized or electrogalvanized steel core wire, aluminized steel core wire's superiority has been most strikingly illustrated by the information obtained from the exposure at P.G. & E.'s Jenner, California, Test Site. This location was by far the most corrosive to all conductors. For this reason and also because the data from this exposure are based on a longer period of exposure, 43 months as compared with 24 months for the other three locations, only the information derived from the exposure at Jenner, California, will be discussed in detail.

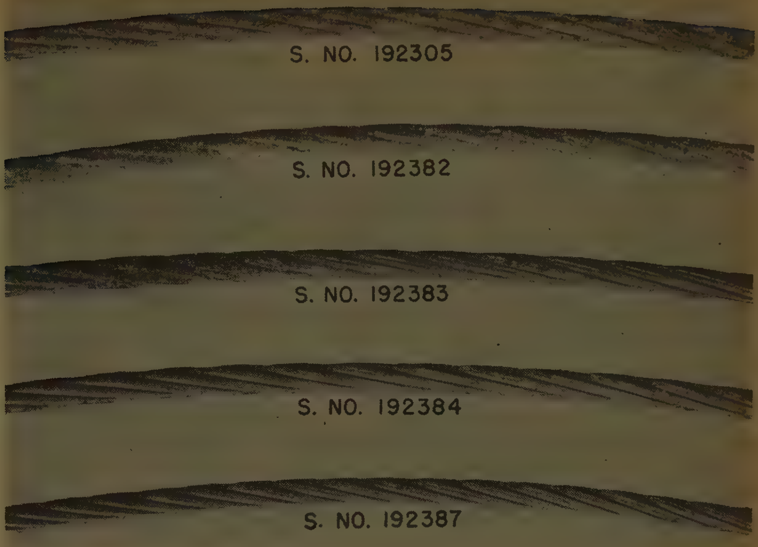
As is evident from Fig. 4, even before unstranding, outstanding performance was indicated for the No. 2 ACSR 6/1 conductor containing the aluminized steel core wire. When the aluminum strands were removed, the virtually unaffected interior surfaces of conductor with the aluminized steel core wire contrasted sharply to the presence of considerable corrosion products in the strand-core interstices and the rusting of the hot-dipped galvanized or electrogalvanized steel core wires, (see Fig. 5). Analyses of the corrosion products in the conductor with galvanized steel core wire showed them to contain largely compounds of zinc, aluminum, and iron.

On the basis of retaining a much higher percentage of coating (weight and thickness), developing no attack into the core, and losing none of its tensile strength, aluminized steel core wire represented a substantial improvement in resistance to corrosion over the hot-dipped galvanized or electrogalvanized steel core wire. (see Table II). Aluminized steel core wire also had less effect on the aluminum strands, as illustrated by lower tensile strength and conductivity losses for these strands.

Coating the aluminized steel core wire with Compound A improved in some respects the performance of the conductor, (see Table II), but this benefit was not apparent on the hot-dipped galvanized steel core wire. Thus, the addition of Com-

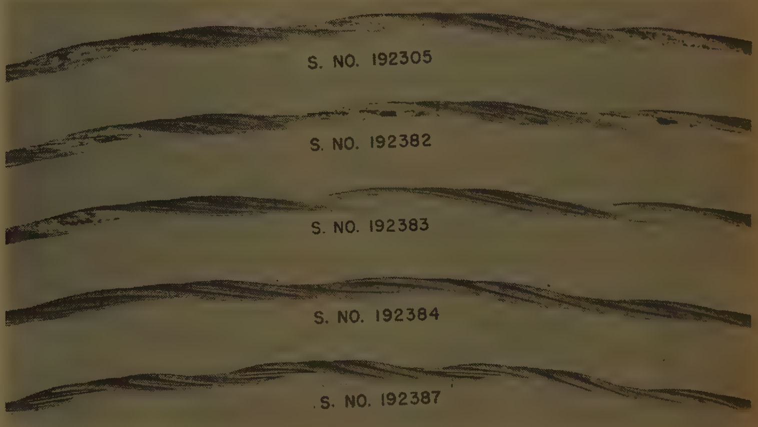
(Continued on page 99)

Fig. 4



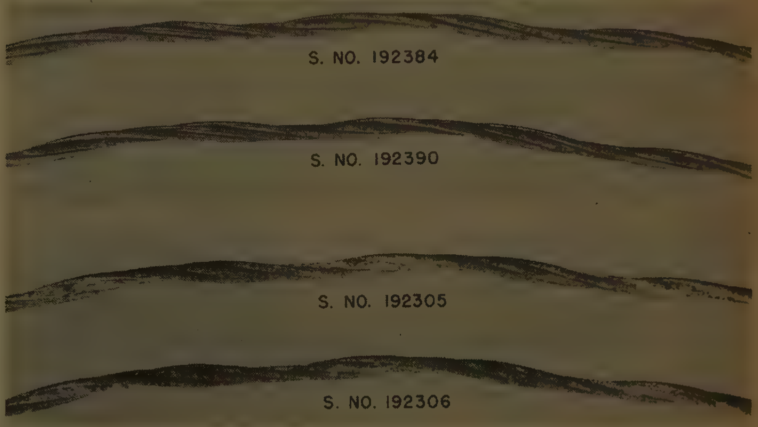
Exterior appearance after 43 months' exposure at the Jenner Test Site of No. 2 ACSR 6/1 containing the following core wires: Sample Number (S. No.) 192305, hot-dipped galvanized; S. No. 192382, Class B Electrogalvanized; S. No. 192383, Class C Electrogalvanized; and S. No. 192384, aluminized. No. 2 all-aluminum (7-strand) conductor (S. No. 192387) had been exposed simultaneously for the same length of time.

Fig. 5



Condition of interior surfaces of No. 2 ACSR 6/1 and No. 2 All-Aluminum conductors after 43 months' exposure at the Jenner Test Site. From top to bottom, the samples illustrated are No. 2 ACSR 6/1 containing hot-dipped galvanized, Class B Electrogalvanized, Class C Electrogalvanized, or aluminized core wire and No. 2 All-Aluminum (7-strand). Three aluminum strands have been removed, so the center wire and the three remaining strands are pictured.

Fig. 6



Photograph showing the interior surfaces of No. 2 ACSR 6/1 with or without Compound A applied to the hot-dipped galvanized or aluminized core wire. Conductors, exposed 43 months at the Jenner Test Site, are identified from top to bottom, as S. No. 192384, aluminized; S. No. 192390, aluminized + Compound A; S. No. 192305, hot-dipped galvanized; and S. No. 192306, hot-dipped galvanized + Compound A.

CAPACITORS SWITCHED VIA CODED MOBILE RADIO CONTROL

Adaptation of surplus mobile radio receivers to coded calling permits system operator to dial capacitor operations at six locations.

By J. E. HOBBS, Supervisor of System Operations
and C. L. GILLIS, Communications Engineer
The Eastern Shore Public Service Company of Maryland

LARGE FLUCTUATIONS in reactive requirements incident to export of power over comparatively long lines to our parent company, the Delaware Power & Light Company, necessitated establishment of some form of control for 23 cmva in capacitors installed at scattered locations on our system.

Since all of our substations are unattended, it was necessary to either utilize manual switching of capacitors by trouble and service men on radio call from the System Operator or to provide for remote control. The former proved impractical and expensive and led to establishment of a rather novel and inexpensive remote control system that has proved very successful. This system is based on coded calling via mobile radio.

Our 23 cmva in capacitors had been installed in previous years when we were deficient in generation. They were controlled by undervoltage relays to permit import of energy on loss of a large unit of generation.

Now our system has a summertime reserve of 89 mw (less transmission losses) which is available to our parent company and the Pennsylvania-New Jersey-Maryland interconnection when economy dictates. Internal reactive generation required for maximum export of power has been noted as high as 40 mvar above the reactive required to carry our system load only. Also, at the time of maximum export our machines are at full watt capacity and thus limited in reactive capacity.

Worked Out Own System

A coded calling device for use with mobile radio had been demonstrated to us and our radio technicians decided it would take care of the coding and decoding required if we could get the signal from point to point. This device was hooked up in breadboard fashion with simulated coupling between the sending and receiving units, and worked so well that it was decided to proceed immediately with the installation of six such units.

There were in our surplus a number of 6-volt mobile receivers, obsolescent due to the advent of 12-volt cars. These receivers were converted to 120-volt a-c operation at rather small cost. With each of these, a four-function SECODE decoder was added and installed with a simple antenna at each capacitor location.

The System Operator has control of three 250-watt transmitters at 48.30 mc so located to give him complete coverage of our system. On his desk a telephone-type dial was installed. A tone generator operating at 2805 cycles was added to the radio rack. To call for a capacitor operation, the proper transmitter is selected, keyed, and dialing of the code initiated. With the first pull of the dial the carrier is modulated by

System Operator J. P. Applebaugh "dialing" a capacitor operation.

C. L. Gillis, communications engineer, points to code wheel of Digital Decoder (cover removed). At right is radio receiver and power supply. This equipment is installed at capacitor location.

the tone. As the dial is released, tone is "chopped" by the dial returning to rest. The break in the tone actuates the stepping relay in the decoding unit.

The decoders are each capable of responding to four codes of five digits each. Where there are two separately switched capacitors at the same location, two "ON" and two "OFF" codes are employed. With only a single bank, one "ON" and one "OFF" code is in use with the other two codes available as necessary for expansion. Tuning of the decoder to the 2805-cycle tone insures complete security from broken stray signals.

There is no check-back feature provided in this system. By observing telemetered voltage and vars from several points the System Operator can tell whether the bank has operated in response to his call. If a bank fails to operate, the call is repeated without hazard.

Beneficial In Other Ways

Voltage regulation of the 69-kv bus at Salisbury now can be held within rather close limits. The largest capacitors bring a voltage change of about ½%. Until the installation of our capacitor-control system, voltage variations of 3% were not uncommon, due to the lag in time required to get a man to the capacitor location.

Another dividend has recently appeared since the Fall maintenance schedule got under way. The amount of spinning reserve required for area protection is taken from a-c board studies and based on var and watt generation necessary to ensure adequate voltage during import of power upon loss of large generation. Quick availability of these capacitors has already released one 8-mw machine from the requirement for a three-week period.

Encountered Some Troubles

As with any new equipment, there were bugs to be ironed out. Most of the early troubles were in failures of components in the old receivers which had been stored for some time. Two of the decoders developed internal troubles and were repaired locally. Another source of trouble was noise appearing in the output of the tone generator which caused erratic operation.

Maintenance in general to date has been moderately high. We believe it should be considerably less from now on.

The initial installation was full of noise which presented us with quite a problem. The noise was traced to a pre-amplifier feeding the microwave. (All communications are conveyed over a link of microwave from the System Operator's room to the radio tower.) The noise source was eliminated and we had a clean tone on the air.

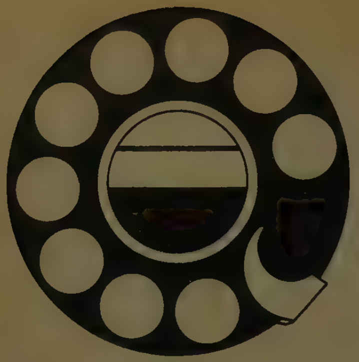
Whip antennas were installed at all decoder locations. At our more distant substations where voice communications varied the whip antennas did not prove successful. We replaced the whips with coaxial antennas mounted on the 35-ft steel structures. Saturation of the limiters was not obtained but enough signal was present to operate the decoder. However, to eliminate the majority of misses the squelch tube was removed. It was believed that the higher frequencies of audio noise due to lack of saturation were amplified by the noise amplifier causing the receiver to squelch and therefore distorting the received 2805-cps pulsing.

The manufacturer recommends that the audio be taken off at the discriminator; however, we found that we did not have the required 1.5 volts at this point. The solution was to take the audio directly off of the plate of the audio output tube and control the audio voltage with the volume control. There is no loading effect on the receiver since the decoder has a 3-megohm input.

Technical Operating Details

The TGS-720 Code Sender or Encoder we are using is essentially a free-running multivibrator with a tuned plate circuit. The standard frequencies are 1500 cps or 2805 cps. We chose 2805 cps because we believed there was less chance of having this frequency pulsed by voice modulation.

A standard telephone dial, ex-



ternal to the encoder, keys the oscillator and causes the tone pulsing. When the dial is rotated a relay is energized which provides a path for B+ to the oscillator. The pulsing is accomplished by opening the cathode circuit of the multivibrator with the off-normal contacts in the telephone dial. There is a four-second time-delay circuit which keeps the relay energized between dialed digits.

The equipment is designed with a 600-ohm balanced output for use with carrier or microwave. Its power supply is a conventional full-wave rectifier and filter network. The tone relay offers an extra set of contacts which we put to use muting our microphones while the code is dialed.

The RPD-634 Decoder contains a 49HS-1 selector which is the brains of the system. This selector is two relays on a common core that are operated by a common coil. An inter-acting armature mechanism drives the code wheel. In this wheel small code pins are inserted, one for each digit of the code. It is the position of these pins that determines the code to which a particular selector will respond.

The code wheel advances one step for each pulse received. If the number of pulses in the pulse train is the same as the number of steps for which the code pin has been set, then the wheel will be held in a partially-rotated position when the pulsing stops at the end of the digit. All selectors not having a code pin in this position will return to zero. As each digit of the code is received by the selector, a code pin must be in the proper location on the code wheel or it will return to zero.

When the last digit is received, the selector will close on a contact pin, thereby initiating the operation with a contact closure. Decoders are available with contact closures from 1 to 5.

The selector cannot add. For example, it will not accept an 8 if it is set for 5-3, 4-4, 2-3-3, or any combination of digits adding up to 8. If a digit is received that is larger than that for which the selector is set, the wheel will be stopped by the code pin, but not held; and, when the pulsing stops, the wheel will reset. This is over-count protection. Any digit received that is smaller than that for which the selector is set also resets the code wheel to zero, thus affording under-count protection.

A sample code address could be as follows:

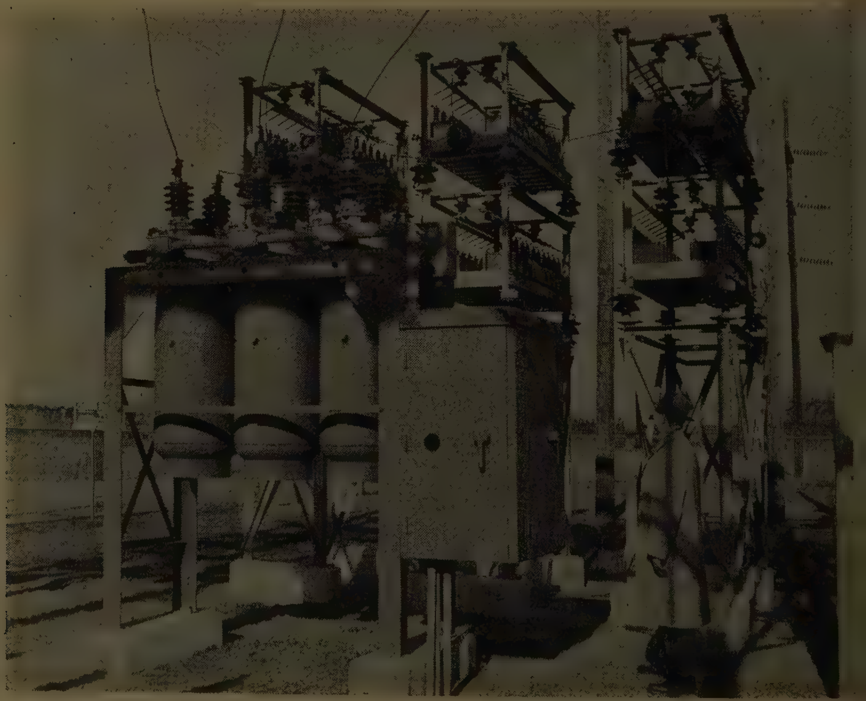
Station No. 1
88462 close capacitor breaker No. 1
88464 open capacitor breaker No. 1
88466 close capacitor breaker No. 2
88468 open capacitor breaker No. 2
Station No. 2
88472 close capacitor breaker No. 3
88474 open capacitor breaker No. 3
etc.

The decoder requires 200-v d-c B+ filament voltage and 120-v a-c. We converted the 6-v d-c power supplies on our receivers to 120-v a-c power supplies. This same power supply was built heavy enough to supply the power to the decoder.

A speaker was installed on the receivers so that anyone in the substation could monitor our system traffic.

With the exception of an occasional miss due to a voltage spike from substation noise our equipment is operating successfully.

The question of legality of this system under Part 11 of Regulations of FCC has been raised. Examination of these regulations do not reveal anything of a clear-cut nature regarding such use. However, definitions and phrases at several points infer or imply that such devices are used.

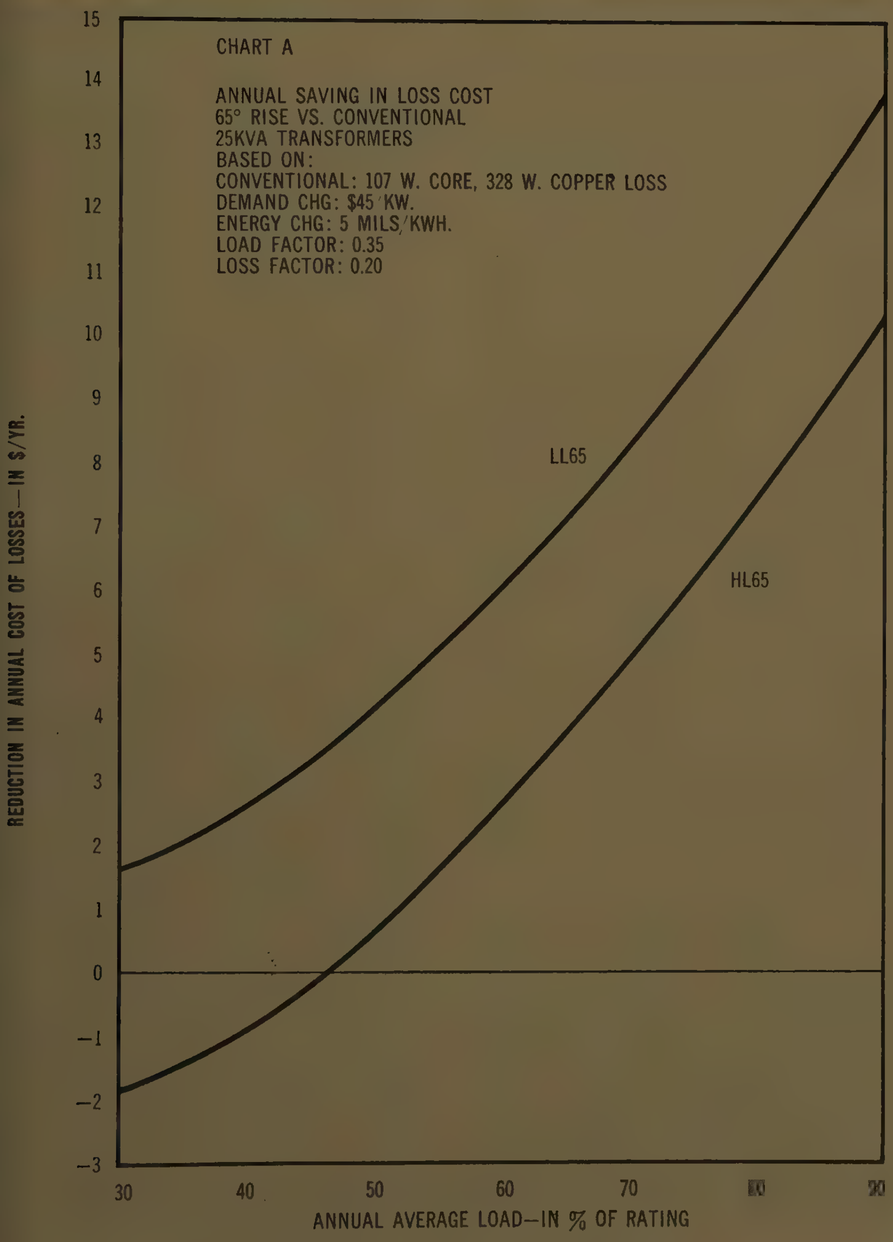


J. E. Hobbs, supervisor of system operations, inspects a typical controlled capacitor installation, rated 3 cmva at 23 kv.

EFFECTS OF 65 DEGREES RISE TRANSFORMERS ON DISTRIBUTION DESIGN

Adoption of 65 C Rated-Load Rise Permits Performance Chang Which Insure Substantial Reduction in Operating Costs

By A. M. LOCKIE, Advisory Engineer, Distribution and Instrument Transformer Department
Westinghouse Electric Corporation, Sharon, Pennsylvania



Economic design and utilization of their equipment has always been a major concern of the utilities. In recent years, increasing attention has been given to the problem of loading distribution transformers in such a way as to maximize the revenue return on transformer investment. Recognizing this interest, various transformer manufacturers have proposed different solutions to the loading problem, including changes in total loss, in loss ratio, in temperature rating or combinations of these. The result has been a considerable amount of confusion in the industry.

Now, departures from past practice, and even from existing standards are not, in themselves, bad. Only thus is progress made. It is important, however, that proposed changes be carefully analyzed to make sure that they do, in fact, accomplish what is intended, and that no undesirable "side effects" are produced. In the case of distribution transformers, only the utilities are in position to make a completely objective appraisal of the alternatives which have been suggested. Perhaps, however, the following discussion will help to clarify certain aspects of the situation, and thus be helpful in comparative studies.

Limitations on Loading

It is quite obvious that, if there were no undesirable consequences, overloading of transformers would improve economy, since a greater return on investment would result. Almost equally apparent are the three fundamental consequences which limit economical overloading. First, there is the thermal limit—heavier loading means higher temperatures which tend to shorten life expectancy. Second, there is the voltage limit—heavier loading means greater voltage drop, which causes customer complaints and reduced revenue. Third, there is the economic limit—heavier loading causes I^2R loss to increase at a faster rate than load, reducing net return per unit output.

Recognizing this situation, the Westinghouse Company began, some years ago, a program aimed at relieving these limitations so as to make heavier loading practical. Our experience in this program is very pertinent to this discussion of loading.

Thermal Limit

At the outset, very little was known about the life expectancy of distribution transformers. The existing standard guide for loading transformers[1] was based on the effect of temperature on the mechanical properties of insulation, but the correlation of these properties with service life was unknown. Consequently, a then-new technique was developed, for measuring life expectancy by accelerated aging, to destruction, of full-size transformers. This technique is now known as "functional testing," and is generally recognized as the best mehod for thermal evaluation of insulation.

Functional testing has proven to be a most valuable tool, not only for improving conventional insulation but as an aid in developing the INSULDUR insulation system. The overall result has been an improvement in life expectancy of at least an order of magnitude. In consequence, thermal considerations seldom limit the loading of INSULDUR-insulated transformers.[2]

Voltage Limit

Though the theoretical knowledge of how voltage regulation could be reduced was available, practical ways of doing so without substantial cost increases were not easy to find. Nevertheless, use of improved magnetic materials and new winding techniques resulted in reduction of impedance from an average of 2.5 percent in 1950 to 1.8 percent in 1960. Thus 40 percent more load could be carried with the same voltage drop.

While this was a substantial accomplishment, it was felt that further reduction in voltage regulation would be desirable to release more of the thermal capability which had been made available. At that time, however, no economical means of doing so was apparent.

Economic Limit

As in the case of thermal limit, it was found that there was very little information on the economics of distribution transformer loading in the literature. Consequently, in 1956 a campaign was launched to stimulate interest in, and publication of articles on, this subject. Since then, many excellent articles on distribution economics have appeared, which have shed a great deal of light on the problem of economic loading.

Some areas of uncertainty persist, particularly:

(1) What are truly representative values of load and loss factors which apply to the annual load cycle on distribution transformers, or are the loads so individualistic as to make the use of "typical" values meaningless?

(2) How should coincidence and peak responsibility factors be established for determining realistic demand charges for load loss?

(3) Should the economics of distribution transformer design and application be studied on the basis of an optimized system or as discrete system elements?

To obtain some information on (1) Westinghouse and several utilities have just completed a large-scale load-survey program, the results of which are now being analyzed. While some excellent discussions of item (2) have appeared[3] further study by the utilities seems to be desirable in this area. In answer to question (3), Westinghouse is proceeding along both lines, on the ground that system optimization is the best guide for future construction, but that transformers may properly be evaluated as separate entities in considering their application on a given system.

Despite these remaining uncertainties, the economic picture was clarified sufficiently to permit a study of how distribution transformer design might be modified to relieve economic limitations on use of thermal capability.

Development of the HL-65 Transformer

For some time it had been suspected that the prevailing ratio of copper loss to core loss might not be the economic optimum. Analysis showed that, if *total* loss was kept constant, and selling price was not increased, then:[5]

(1) There is a critical load level, above which a reduced loss ratio is economical.

(2) The magnitude of this load is determined solely by how the operator evaluates losses.

(3) For commonly used values of losses, and operation in a load range which is practical, a loss ratio of 2:1 could result in substantial operating cost reductions in comparison with prevailing loss ratios, which range from 3:1 to 4:1, or even higher.

(4) The reduction in loss ratio would be accompanied by lower impedance which would further relieve the voltage limitation on load.

The study also revealed that, in those cases where reduction of loss ratio to 2:1 would result in savings, a greater reduction in ratio would produce still greater savings. Unfortunately, these very low loss ratios would increase manufacturing costs so that a price increase would be inevitable. Indeed, development and early production of transformers with 2:1 ratio could not be justified unless other means were found to reduce manufacturing cost.

At this point, the situation could be summarized as follows:

(1) Thermal capability had been increased to the point where it could not be fully utilized because of voltage and economic limits, according to numerous operators.

(2) These voltage and economic limits could be relieved by a reduction in loss ratio.

(3) Production of a new line of transformers could be justified only if cost could be reduced.

The natural question then was: Why not trade excess thermal capability for reduced losses and voltage drop? The answer seemed to be the HL-65—a transformer with 65 C rated load rise and a 2:1 loss ratio. This would save on manufacturing costs, at least in some ratings, by reducing the need for supplementary cooling. The result would be a transformer with well-balanced load limits and reduced operating cost in a usable load range, salable initially at no increase in price, and offering the possibility of price reduction when in volume production.

The HL-65 was offered to the utilities on a trial basis in a limited number of ratings, and met with ixed reactions. Numerous utilities, fter careful analysis, found it to be ighly desirable.[4] In some areas, owever, loads result in exceptionlly low load and loss factors, reucing the evaluation of copper loss elative to core loss. In addition to his natural effect of the loads, the ctual value placed on copper and ron loss by some utilities is such as o make the lower copper to iron oss ratio transformer design less esirable, if the design incurred an ncreased core loss. In these cases tilities were reluctant to accept the IL-65 even with its promise of ultinate cost reduction through reluced price.

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[1] See numbered references at end of paper

It is manifestly uneconomical for nanufacturers to produce two comlete lines of transformers—one for hose customers who prefer the HL-5, and another for those who preer conventional performance. Conequently, a compromise has been leveloped which will insure imortant reductions in operating osts, regardless of loading practice f the nature of the load cycle. In his design, designated as the "LL (for low loss) 65," the copper loss s the same as in the HL-65, while he core loss is equal to or less than hat of a conventional transformer. Studies based on load and cost data rom numerous utilities indicate hat the reduced operating costs are quivalent to reduction in first cost anging from 10 to 15 percent.

Other Solutions to the Loading Problem

Other solutions to the loading roblem have been proposed. Of hese, certainly the most widely disussed is the 55/65 C "rating." While the logic behind this "rating" aries among the manufacturers vho use it, it is nothing more than a claim by the maker that the transormer may be operated continuusly, at a load corresponding to the 5 C rise, with "normal" life exectancy. In some cases, the claim s backed up by experimental evilence; in others, it is not. In any vent, it is strictly a statement of hermal capability, since performnce (losses and impedance) are unhanged, and are guaranteed at the 5 C rating.

Unfortunately, the 55/65 "rating" nay be construed as meaning that the transformer may be operated at the 65 C "rating" without penalty of any kind, or that it is equivalent in performance to the HL-65. Actually, of course, the 55/65 unit, when operated at the 65 C "rating," will have more than 12 percent greater voltage drop and about 10 percent greater loss, per kva of output, than at its 55 C rating. At any load, a 55/65 unit will have 10 percent more copper loss, and about 5 percent more voltage drop, than a corresponding LL-65 transformer.

Another proposal is the utilization of improved insulation to build transformers with 65 C rated rise but no change in loss ratio, savings in cooling cost being reflected in reduced selling price. Superficially, this sounds attractive, but closer examination reveals drawbacks. An increase in rated load rise with the same losses means more rise per watt loss. The result is very substantially increased temperature on overload unless the loss ratio has been reduced, or unless uneconomical design changes are made which might well negate the savings resulting from reduced cooling. These higher temperatures on overload mean increased losses and voltage drop, and reduced life expectancy.

Load Monitoring

There can be no doubt that overloading of distribution transformers is economically justifiable, particularly in the case of the HL-65, which was designed with that in mind. In fact, some degree of overloading is almost universal practice. It must be kept in mind, however, that deliberate overloading to the economic limit presents the probability that some transformers may become loaded to the point of undesirable reduction in life expectancy, through unexpected load growth or loss of diversity. For this reason, load monitoring becomes increasingly important as planned load limits are raised.

In the past, load monitoring was done chiefly by spot checks with thermal-demand meters or through observation of the signal lights on protected transformers. Recently, with increased use of business machines for customer billing, there has been much thought given to the monitoring of load through totalizing the monthly kwh output of transformers. There can be no doubt that this technique, if properly done, is far better than the meter checks. It also promises some advantages over use of the signal light, in that underloading, as well as overloading, can be detected and, if loading follows a forecast pattern, attainment of the planned load limit may be forecast. In addition, it is applicable to all transformers, regardless of age or type.

These apparent advantages may be illusory, however. It seems highly unlikely that, even if an underloaded transformer is detected, it would be economical to replace it with a smaller rating. Accurate forecasting of peak load is possible only if load growth follows a definite pattern. The very "universality" of the method means that differences in economic or thermal capability of transformers cannot readily be recognized. Finally, the accuracy of the method depends on the validity of the multipliers used to convert kwh to kva. This, in turn, depends on the quality of the sampling used in setting them up, how well a given installation conforms to the sample, and whether it continues to conform.

On the other hand, the signal light, being actuated by the actual load on the transformer, automatically evaluates changes in load cycle, unexpected load growth, loss of diversity, and any other significant changes in load. Furthermore, being coordinated with the transformer's economic load capability, its setting may be changed to suit the transformer design. (For example, since the HL-65 can be economically loaded more heavily than conventional transformers, its signal setting is higher.) Much the same comments can be made regarding the load-actuated indicator, now available for conventional transformers. It seems quite probable, then, that use of these devices constitutes a more reliable method of load monitoring than the kva-kwh calculation.

Summary

To obtain maximum return on transformer investment, they should be loaded as heavily as is practical.

(Continued on page 98)

T&D Representatives Told They Spend Half Of Utilities' Budgets

S. M. Hamill, Jr., Cincinnati Gas & Electric Co. VP, welcomed about 200 utility engineers to the 85th meeting of the EEI Transmission and Distribution Committee by reminding those present that about half of the money spent by electric utilities has been for T&D. He also commented that the number of people responsible for spending the T&D money is much less than the number responsible for spending the other half of the budget; therefore, the financial responsibility of individuals in T&D is greater than in most other departments of utilities.

Measuring Service Performance

Adequate means of measuring service performance and ability to pinpoint areas where service is poor were given in a paper presented by H. L. Collins, Pennsylvania Power & Light Co., as objectives necessary to improve electric service performance. He also noted that interruptions have taken on new prominence with increased customer dependence on electric service—especially with the intensive promotion of the all-electric home. Collins reported, that records at PPL revealed that most of the customer interruptions were caused by failures on the distribution system. The *customer interruption,* which is defined at PPL as an interruption of electric service to a customer for more than one minute, is used in Collins' paper as the basic unit for measuring service performance.

H. MacVaugh, Philadelphia Elec. Co., showed the group a ream of tabulated data on interruption for one of the nine divisions at Phila. Elec. Co. to illustrate how much data can be accumulated, but MacVaugh was pondering what to do with the "miles of data" after it is put on machine tabulations. He believes that the "miles of data" are necessary but the time and effort involved in analysis of the data is a problem.

Service Interruptions

Respacing of primary distribution conductors from 16 in. to 32 in., spending $140 per circuit mile for tree trimming each year and installing more adequate line protection are some of the ways that Duquesne Light Company reduced their line failures due to tree-interference, according to T. Hunter. Their mean system average failure rate of 2.8 failures due to tree-interference per circuit over the two-year period of 1955-6 was reduced to 0.33 for 1959-60, Hunter reported.

V. O. Bernthal of Commonwealth Edison mentioned that his Company keeps records that reflect whether a tree fault is due to tree contact or if it is due to limbs falling on the line. He mentioned that the limbs falling on the line is not necessarily due to poor tree trimming. Bernthal said that Commonwealth Edison keeps records on interruptions by divisions so that each division can be compared with the company average. This reveals where it is necessary to concentrate on the interruption problems.

In a discussion on interruptions it was mentioned that *standards* of acceptable frequency and duration figures for interruptions would be good for comparison purposes. However, this idea was squelched when it was pointed out that there are too many variables, such as voltage, spacing, climate, etc., to set up a standard for comparison.

During the discussion, Charles Kiel, Vice President, Long Island Lighting Co., revealed a solution to the problem of joining old copper wire with new aluminum wire. He mentioned that trouble will develop at a copper-aluminum junction if the copper strands are not separated and cleaned thoroughly. Kiel said that the problem of separating and cleaning the copper strands can be eliminated by first splicing in a new piece of copper wire before making the copper-aluminum junction.

M. R. Mosquini of Southern California Edison Co. reported that his company had found through an extensive analysis of connectors that aluminum connectors are just as reliable as copper connectors. He emphasized that both copper and aluminum connectors are more reliable than the methods of applying them.

As mentioned by Kiel, Mosquini emphasized that extra care should be taken when cleaning old copper for making a copper-to-aluminum connection.

Recommended procedure given for making connections is:

(1) use a wire brush to clean contact surfaces and remove irregularities with emery cloth.

(2) coat these surfaces with an inhibitor immediately after cleaning.

Calculating Outage Frequencies

Zane Todd, Indianapolis Power & Light Co., presented a very interesting paper on "A METHOD FOR CALCULATING OUTAGE FREQUENCIES IN TRANSMISSION AND DISTRIBUTION SYSTEMS." His reasoning for developing this method was that generating-equipment outages have been predicted for some time and as long as any electrical equipment has been in service long enough to establish an average rate of interruption, it should be possible to predict future reliability based on past experience. Todd suggested that common sense should establish that equipment having a long history of failing frequently should continue to do so; on the other hand, facilities that have been dependable in the past should be reliable in the future. Todd's calculations were verified by experience with service to 100 residential customers over a six-year period.

Precast Concrete Used In Underground Distribution

In lieu of reading R. C. Blankenburg's paper "PRECAST CONCRETE FOR CUTTING COSTS," a film was shown which demonstrated the installation of precast concrete vaults. According to

Blankenburg's paper, the Southern California Edison Co. is installing 4'x6'x7' precast manholes for about $550 where the previous poured-in-place manholes of comparable size were being installed at an average cost of $950. Southern California Edison also uses precast concrete for manhole covers rather than cast iron and the cost for covers has been cut in half using the precast concrete. Again, *standardization* is the key to cutting costs.

Underground Distribution

W. J. Montgomery, Cincinnati Gas & Electric Co., explained some of the details of the underground network in Cincinnati. Among many good slides shown by Montgomery was one of the monthly inspection form used with inspection of vaults and equipment. This detailed form is completed for each vault every month except December. The service men make minor adjustments on protectors, change relays when required and maintain nitrogen gas on the transformers when making the monthly inspection.

EEI Underground Cable Performance Report For 1959

H. L. Davis, Jr. of Philadelphia Electric Co. gave the 1959 Underground Cable Performance Report. He explained that the Cable Operation Report for 1959 should be available for distribution early in the Fall. This report is the result of a combined effort of the Edison Electric Institute and the Association of Edison Illuminating Companies and will present the experiences of 16 companies, each of which operated 200 miles or more of high-voltage (over 7.5 kv), paper-insulated, duct-lay cable.

Davis showed slides indicating the cable-installation trends for four voltage classes. He pointed out that the 7.6- to 15-kv cable contributed 43 percent of the total increase in underground cable during 1959. Cable rated over 45 kv increased substantially during this period and now accounts for 25 percent of the cable installed. Davis pointed out that the major sources of underground-cable trouble continues to be unknown. He suggested anyone interested in cable failures should read Walter Bullock's article on "DIAGNOSIS OF PILC CABLE FAILURES HELPS PREVENT OUTAGES" that appears in the May 15, 1961, issue of *Electric Light & Power*.

Direct-Buried Cable Not Satisfactory

According to a paper given by C. R. Machen, Pacific Gas & Electric Co. charges a subdivider the difference in cost between the underground system and an equivalent overhead system when the developer requests underground distribution. Services are installed by the customer.

The developer, obviously, is interested in the lowest possible cost for the underground distribution. However, Machen revealed that PG&E experience with direct-buried cable has not been satisfactory; so present standards for residential underground specify the installation of ducts in the parkway or sidewalk area for both primary and secondary cables. Transformers are located on side lot lines near the front property lines. Either pad-mounted transformers or overhead transformers in surface-mounted metal enclosures are used at PG&E for underground distribution in residential areas.

Cable Movement

After an extensive survey on cable movement, R. H. Kolks, Cincinnati Gas & Electric, found that cable movements and strains in the lead sheath show a wide variation in field measurements and cannot easily be predicted. He recommends standards for manhole designs and cable racking be established to allow for cable movement without excessive sheath damage.

Scheduling Engineering And Construction Work Load

After being faced with spiralling overtime costs in 1955 during an enormous expansion program at Boston Edison, a new scheduling group was authorized, according to R. M. Lewis. This new group, designated the Coordinating and Expediting Division, was given the responsibility of effective scheduling of construction projects.

Transmission Line Maximum Thermal Capacity

According to a paper presented by C. H. Scofer, Pennsylvania Power and Light Co. made a study of the thermal capacity on 230-kv transmission lines with conductors of 795,000 and 1,033,000 cm ACSR. On the older circuits, where clearance requirements limited the loading, the current-carrying capacity for 795,000 cm ACSR was established at 1125 amps for summer and 1325 amps for winter conditions on the PPL system, Scofer reported. In the case of the newer lines where annealing was the limitation due to reduced conductor strength, a current of 1281 amps in summer and 1455 amps in winter can be used on the 795,000 cm ACSR without exceeding 125C in the conductor. The strength of the steel core in the ACSR conductor remains essentially constant up to 450C.

Bare-Hand Live-Line Maintenance

A discussion on the bare-hand method of live-line maintenance was presented jointly by H. L. Rorden of American Electric Power, H. J. Troche of Holan Corp. and C. J. Miller, Jr. of The Ohio Brass Company. These men claim the idea of working bare-handed on an energized conductor from a shielding screen that is electrically connected to it is both *feasible* and *practicable*. For more information on this subject see *Electric Light & Power*, December 15, 1960—p. 62.

Three-Legged Aluminum Transmission Towers

J. M. Maples of Reynolds Metals Co. explained some of the developments made in structural aluminum during the past decade. He mentioned that the key to the design of competitive aluminum structures lies in: (1) the inherent resistance of aluminum to weathering, (2) the light weight of aluminum and (3) the fact that aluminum can be extruded into any desired shape. Maples said that the realization of the aforementioned facts led to the design of a three-legged aluminum transmission tower.

Some of the advantages that were given for a three-legged tower are:

1. Fewer pieces to fabricate, ship and erect.
2. Fewer connections necessary.
3. One less footing required.
4. Added safety clearance for linemen—climb center leg.
5. Ease in assembly and erection.

New Resuscitation Technique

J. J. Misic, Cleveland Electric Illuminating Co., gave a very interesting and informative presentation on *what to do* in the following accident situations:

1. Breathing stopped and the heart beating.
2. Both breathing and heart stopped.
3. Breathing stopped and the heart in ventricular fibrillation.

Misic showed a film to illustrate closed-chest and opened-chest methods of heart massage. He emphasized that *speed* in starting resuscitation is a *must* as brain damage may occur within minutes.

An excellent instruction folder titled "First-Aid Resuscitation Techniques," which explains closed-chest heart massage and mouth-to-mouth artificial respiration, was made available to those in attendance. This folder was developed for instructing the employees of CEI Co. but has been made available to other interested organizations for training.

Working 12 KV With Rubber Gloves

The safety code for Dayton Power & Light Company provides for working 12-kv wye with rubber gloves. L. L. Renas of this Co. explained that additional insulation protection must be used to work a line that is 12-kv phase to phase or 6900-v phase to ground, however. This added insulation means an insulated stool, insulated ladder, Kearney board or devices approved for this purpose according to Renas. The Kearney board is a device developed through the efforts of Joseph Zell (DP&L) and built by the J. R. Kearney Corp.

Each lineman is issued two pair of 10-kv rubber gloves at DP&L and each pair is used on alternate two-week intervals. The gloves are inspected and tested at the end of each two weeks' use.

Highlight of PCEA Annual Convention:

Symposium on Atomic Power—PG&E Calls It A "Must" for California in Near Future

A symposium on "The Future of Atomic Power" dominated the program of the recent 44th annual convention of the Pacific Coast Electrical Association held in San Francisco. The discussion was led by Norman R. Sutherland, president of Pacific Gas and Electric Company, and the participants were: W. Kenneth Davis, vice-president of Bechtel Corporation; Harold Quinton, board chairman, Southern California Edison Company; Lewis Lengnick, vice president and chief engineer, Hawaiian Electric Company; C. C. Whelchel, chief mechanical engineer, Pacific Gas and Electric Company.

Mr. Sutherland opened the symposium with the proposal that "we talk about the present as well as the future:" He declared:

"The present is here—very actively here—and the future is no farther away than the next plans of any utility company. The electric industry, always progressive, embraced atomic power as soon as it entered the public domain. We recognized that it would do a lot of things for everyone and in a new way. Atomic power started a technical revolution in industry and th
end is nowhere in sight."

Introduced by Mr. Sutherland a
"the man with the job of integrating
nuclear power into PG&E's larg
operating system," Mr. Whelche
said:

Pacific Gas and Electric Com
pany believes that "atomic power i
a must for California in the fore
seeable future," and that "except fo
special situations, PG&E's last con
ventional (gas- and oil-fired) steam
operated generating unit will be in
stalled in the late sixties."

Mr. Whelchel followed up with
the declaration that the utility's
studies on a large-scale nuclea
plant near San Francisco "are nearing completion." If built, "this plan
would have a capacity in excess o
300,000 kilowatts."

"Eventually," he continued
"atomic plants are expected to produce power at a lower cost per kilowatthour than conventionally-fuele
plants. Thus, they will release oi
and gas for other purposes. And
with the safety record of earlie
plants to build on, these atomi
plants of the 1970's and beyond wil
be accepted at good industrial sites.'

The PCEA Symposium on atomic power was presented by (l to r): W. Kenneth Davis, Bechte Corporation; C. C. Whelchel, Pacific Gas and Electric Company; N. R. Sutherland, president o PG&E; Lewis Lengnick, Hawaiian Electric Company; Harold Quinton, chairman of the board Southern California Edison Company. At the rostrum is Jack K. Horton, president of Souther California Edison, who presided over the session.

Regarding prospects of coming conomies in nuclear power, Mr. Vhelchel voiced confidence that the ost of reactor fuel will decline in he near future, that better and less xpensive ways of fabricating fuel vill be found and that its performnce and life will improve. He also redicted lower costs for building uclear plants.

"Capital costs of atomic plants vill be lowered by repetitive contruction, by improvements and urther simplification in design and y increasing unit size. The handul of plants now operating will oint the way to vastly improved lants in the future, which will take heir place alongside the convenional steam and hydroelectric reources now carrying the load," prelicted Mr. Whelchel.

Mr. Davis declared: "There is no uestion about it—nuclear power lants are technically feasible and an be used to meet the mounting eeds for electric energy. Although onstruction, fuel, operating and naintenance costs are high, all are eing reduced. Fuel, operating and naintenance costs eventually will e as low as those of plants using onventional fuels.

"Construction costs of nuclear ower plants probably will remain omewhat higher than for convenional plants. However, construction f nuclear plants will become ecoomic by building large units so hat the cost of shielding, control nd special facilities will be spread ver a greater kilowatt capacity and y using a high load factor to spread he capital cost over a larger kilovatthour output."

Mr. Davis pointed out that many roblems still exist, necessitating he continuing need for developnental work to produce better maerials, especially improved fuels. Ie also urged further work for afety and stated that AEC action is equired to obtain data on safety nd to assist in developing the most conomical plant design.

The Bechtel executive closed with he prediction that "nuclear power vill make a major contribution to he supply of electricity for the Paific Coast."

Mr. Quinton pointed out that: Remarkable progress has been nade in reducing the unit cost of nuclear power plants. It seems clear that capital costs now are possible which may be no more than one-fifth of those obtained from the original plant at Shippingport, Pennsylvania, with intermediate points on the 'learning curve' at around 47-percent, 35-percent and 28-percent of that original cost."

Incoming and outgoing leaders of the Pacific Coast Electrical Assoc. exchange good wishes at the Association's recent annual meeting. At left: newly elected Pres. H. G. Dillon, president of San Diego Gas & Elect. Co.; at right: retiring Pres. H. F. Hartzell, of San Francisco.

He added: "The future seems bright, but it involves answers to some major questions, and offsets to some risks, which a builder of a nuclear plant must resolve."

"Another cost factor of great importance," he said, "is that for core fabrication and management. Unfortunately, for nuclear power plants it is necessary to buy from one to three years' fuel inventory before commencing operation, a condition that does not prevail in any conventional plant with which I am familiar. Naturally, this requirement calls for a substantial capital expenditure—beyond the cost of the plant itself—in the early years."

Among other factors "of considerable concern," Mr. Quinton listed the cost of conventional plants used for purposes of comparison. These range from $80- to more than $200-per kilowatt, depending on design, site conditions, fuel and other items.

"Accordingly," he explained, "a nuclear plant that is competitive with a conventional plant of $150 per kilowatt may not be competitive with one of $110 to $120 per kilowatt."

Additional questions which are not resolved but will significantly affect future costs were given as follows:

1—How will future fuel processing be done and how will costs be determined and distributed?

2—Will the government always own nuclear fuel?

3—Will the government always be willing to pay for plutonium recovered and at what price?

4—Will the government be equipped to handle all reprocessing requirements on a cost basis no higher than has been recently quoted and considered?

5—The problems of sites and operating costs.

"It seems reasonably certain," Mr. Quinton declared, "that nuclear power plants now are competitive in a number of areas of the world and, with more definitive determination of the points I have mentioned, there is good reason to believe that they also will be competitive in some areas of this country within this decade in terms of their total overall costs."

Hawaiian Electric had an engineering and economic study of nuclear power made in 1958 and plans another next year, Mr. Lengnick noted in reporting for his utility.

Planning And Operating Tomorrow's Distribution System Is Theme Of Line Material Seminars

George Cooper, L-M Director of Product Management, opened Distribution Seminars on May 16th and again on May 23rd with a dramatic entrance from above on a boatswain's chair connected to the overhead crane in L-M's high-voltage lab at Franksville, Wisc. Although L-M has a present worth of approximately $1-million in their new Thomas A. Edison Laboratories, plans for the future indicate that this is just a good start toward developing these facilities.

These seminars provide an opportunity for electric utility key engineering and operating personnel to join L-M representatives in gaining greater knowledge of mutual challenges and opportunities. They also accord a splendid opportunity for three-way communication:

1. between key engineering and operating utility men.
2. from user to manufacturer.
3. from manufacturer to user.

L-M's E. W. Williams, VP Marketing, pointed out that due to his Company's dedication to the principle that a manufacturer should develop and manufacture products designed to meet the requirements of the customer, L-M is enabled to celebrate its fiftieth anniversary in 1961. He also mentioned that a Company should not be judged by its facilities—no matter how elaborate—but that a **Company is known by the people it keeps**, which happens to be the name of an L-M employee publication. To keep up with the continuous development of distribution equipment, L-M is attempting to retain versatility and flexibility by keeping the lines of communication between the user and L-M laboratories and factories as short as possible, according to Williams.

R. P. Thompson, Manager of Central Engineering and Research, explained the work that is now being done at the Franksville Lab and discussed some of the future plans for the Engineering and Research Center to be completed on the 134-acre tract of land on which the present lab is centered. He noted that the present high-voltage lab will deliver a 1.5 million-v surge and is being expanded to produce two million volts by adding capacitors.

George Cooper soars in from overhead to open L-M's second annual Distribution Systems Seminar.

After discussing the evolution of distribution systems, much animation was created among the group concerning the changing of 4-kv systems to higher voltages. The consensus of opinion seemed to be that it is not feasible to convert the present 4-kv systems in the downtown sections of large cities to higher voltages but that industrial loads, fringe areas and new developments should be changed to higher distribution voltages. This may leave *islands of 4-kv systems* but most participants in this discussion doubted the feasibility of expanding present 4-kv systems.

Because 40 to 50 percent of total system investment is in distribution, this segment is receiving increased attention, according to R. P. Thompson. He stressed service reliability as the American public has come to expect electrical service as something that happens automatically at the flick of a switch or the push of a button. Thompson mentioned that lightning protection was an early problem on distribution systems and is becoming more important as system voltages have doubled, tripled and quadrupled.

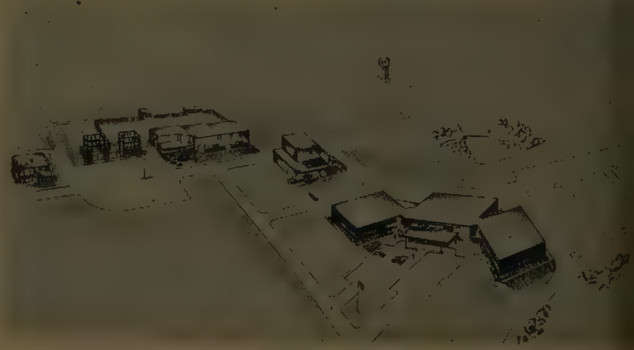
Thompson related some of the statistics of progress in valve-type arresters: A 1961 nine-kv arrester is only about ⅔ the length of the 1941 equivalent; also, the maximum discharge voltage on a 20,000-amp surge for present distribution arresters is from 35 to 46 percent below the discharge voltage of the 1941 equivalent. He also pointed out that a 15-kv, 100-amp open-type fuse cutout in 1941 had an interrupting capacity of 2000 amps where today's 15-kv, 100-amp open-type fuse cutout has an interrupting capacity of 16,000 amps—eight times the old rating! Besides increasing interruptible ratings of automatic oil circuit reclosers, electronic control was added in 1960, according to Thompson.

Capacitors And Transformers

The history of power capacitors was presented at the Seminars and comparisons of weight per kvar were commendable. In 1946, capacitors weighed about six lbs per kvar and today's modern unit weighs only 1.82 lbs per kvar. With the trend toward reduction of size and weight of transformers and capacitors, it is conceivable that factory assembly of unitized capacitors and transformer banks may be the next big step. Of course **standardization** would have to come first in order for the economics to justify such improvements. Creativity imagination, faith and a pioneering spirit are needed, it was said, in order to meet the challenge to plan and operate tomorrow's distribution system.

Distribution Voltage Trends

Voltage was claimed as a libera-

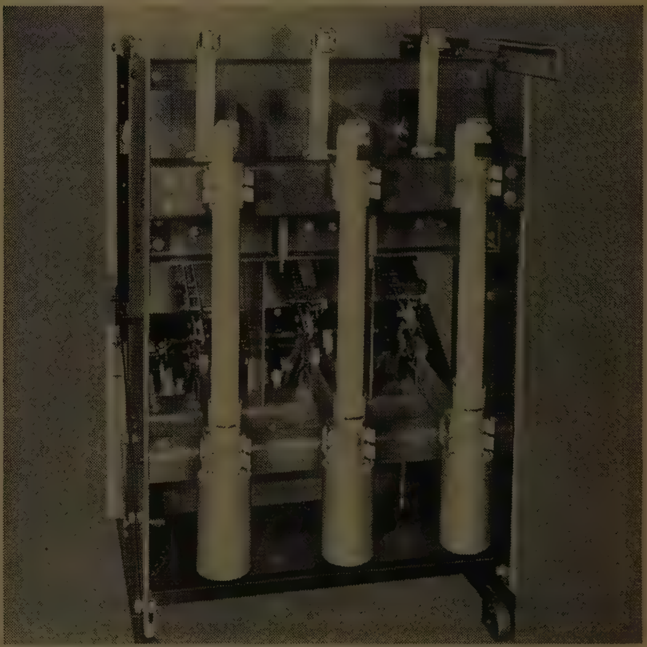


Artist's conception of Line Material Industries' future Engineering and Research Center.

New...Low-Cost, Drawout DFS Metal-Enclosed Load-Interrupter Switchgear

DFS Switchgear comes in single units or switching centers, as shown, for service entrances, transformer primary or feeder switching.

DFS drawout switch and fuse element is easily levered into cell.



DFS switch and fuse element, rear view.

Type DFS Metal-Enclosed Switchgear—*drawout fused switch*—provides compact, low-cost power switching for high voltage circuits in commercial buildings, institutions, and small industrial plants. DFS Switchgear meets a wide range of applications—with fault interrupting ability up to 250 mva at 4160 volts and 500 mva at 13,800 volts . . . load break rating 600 or 1200 amperes . . . full fault closing ability of 60,000 amperes for 5 kv and 40,000 amperes for 15 kv.

DFS Switchgear provides these major advantages:

Drawout design assures completely safe switch inspection and fuse replacement.

Component design versatility meets a broad range of applications, including automatic transfer and remote control.

Simplified metal-enclosed construction presents compact, modern appearance.

Maximum service reliability assured by extensive High Power Laboratory design-proving tests.

For full information call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa., for Descriptive Bulletin 32-750. *You can be sure . . . if it's Westinghouse.*

J-61011-R1

Westinghouse

tor in all elements of the power system. As the system loads increase, the need for higher voltages in transmission, distribution and utilization are needed. Some of the advantages of higher voltage were pointed out, such as: (1) Improved aesthetic appearance of pole lines, (2) reduced maintenance costs and (3) reduced system costs and losses. Also, frequently-mentioned disadvantages of higher-voltage distribution were itemized, such as: (1) Increased outages due to greater circuit exposure (2) Hot-stick crews or insulated buckets are needed for maintenance and (3) lack of distribution apparatus presently available for system voltages above 15 kv.

Systems Of The Future

Economic studies along with good judgment will be required to find solutions to future distribution design, it was noted. The encapsulated transformer was mentioned as one of the most revolutionary developments in electric power distribution equipment for many years. It can, in effect, cut five ft off the top of each transformer pole in overhead construction and can revolutionize underground distribution.

The problem of whether to increase primary distribution voltage or to concentrate on underground distribution was discussed at length. It seemed to be the consensus of opinion that it would not be practical for a utility to concentrate on both alternatives at this time—especially considering voltages above 15 kv.

Selection Of Arrester Voltage Ratings

H. R. Rowe, L-M's Product Manager, Protective Equipment and Capacitors, gave the following recommended arrester sizes for given voltages as found in tests and experience at L-M on four-wire grounded-neutral distribution circuits:

Circuit Voltage (kv)	Arrester Rating (kv)
7.2/12.47	10
14.4/24.9	20
20/34.5	27

Mounting an arrester very far from the device it protects is poor operating practice as was pointed out in a presentation and also was proven vividly in a demonstration.

20/34.5-kv Distribution

A. R. Waehler, Director, Transformer Product Sales, gave credit to the Idaho Power Company for pioneering 20/34.5-kv grounded-wye distribution over four years ago. L-M in experimenting with Idaho Power on the 20/34.5-kv concluded that the greatest opportunity for economy and sound practice seemed to lie in the choice of a 27-kv arrester and a 150-kv system BIL.

Proof of utility interest in the 20/34.5-kv philosophy was emphasized in that L-M produced eight times as much kva in this voltage transformers in 1960 as in 1959.

Aerial Cable And Underground

Appearance, continuity and service quality were listed as strong factors for suggesting underground distribution in suburban areas. Spacer-type aerial cable was mentioned as a compromise between open wire and underground and it shows indications of meeting the need for an economical, neat-appearing and storm-resistant system. Demonstration of short-circuit tests using aerial-spacer cable was observed by those attending seminars.

Pad-Mount transformers, power pedestals and *Transclosure* housings were shown to the group and mentioned as possible turning points in economical considerations of underground vs overhead construction.

Fault-current interruption of fuse rated for phase-to-ground voltage but exposed to phase-to-phase fault on simulated 34.5 kv distribution system is observed by the group in the short-circuit lab testing area. Expulsion of arc-produced gases can be seen.

Aluminum Transmission Poles

L-M has supplied lattice-type 85 ft aluminum poles to a utility located in the South. An octagona aluminum pole has also been developed at L-M in 85-95 ft heights Detachable pole steps have also been developed for octagonal poles

Substation Capacitor Costs

Besides realizing savings from including capacitors on a utility system, it was pointed out that additional economy can be designed into the substation capacitor banks.

By prefabricating blocks of capacitors by the manufacturer the initial costs and area needed can be reduced and aluminum used for structural parts will eliminate much of the maintenance. Also, L-M uses stainless steel instead of mild steel for capacitor tanks to add to corrosion resistance. Again, standardization was stressed to help reduce costs.

Substation Reclosers

At L-M it was felt that the hydraulic recloser lacks the *flexibility* in application which is required for more general acceptance for substation protection. Therefore, L-M has developed electronic controlled reclosers for substation use. These new reclosers (type RE and WE) are now in production and a very interesting demonstration was given on a model of the Type RE recloser to show its flexibility. The control is separate from the recloser proper and connected to the recloser by a multi-conductor cable in the electronic types.

Street And Highway Lighting

The history of street and highway lighting was traced from lighted candles in the window to the modern street lighting of today, which got its big boost from the invention of the automobile. Street lighting was pointed out to be one of the *hidden values* that require special weighing in evaluating the over-all economic effect of service by the power supplier. Adequate street lighting was emphasized as being not only desirable, but absolutely necessary.

The difference in electrical cable starts with a rainmaker

You can't predict the weather but you can be sure USS Tiger Brand Cable has built-in weather resistance. In our research laboratory we create the worst possible weather conditions—baking sun alternated with driving rain—just to see how much torture a cable can stand. A few hours in our weather-ometer is the same as years of actual service. After this accelerated aging, we thoroughly test all the insulating and jacketing materials used in Tiger Brand Cable. We check for cable stability, tensile strength, elongation and flexibility. A microscopic examination checks for crazing and cracking. Various chemicals, micro-crystalline waxes and other antiozonants are then added to the insulating compounds to reduce ozone cutting and increase weather resistance.

This is just one of the many ways our Research and Development Department makes sure the quality of USS Tiger Brand Wire and Cable is the best you can get. Our research laboratory tests all materials used in Tiger Brand products. We experiment with new materials and methods to make Tiger Brand Wire and Cable even better. We have the facilities, right in our laboratory, to make all kinds of experimental cables—from control cable up to high voltage cable.

That's why, whatever the job, it pays to specify USS Tiger Brand Electrical Wire and Cable. You can't buy better cable. American Steel and Wire, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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American Steel and Wire
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
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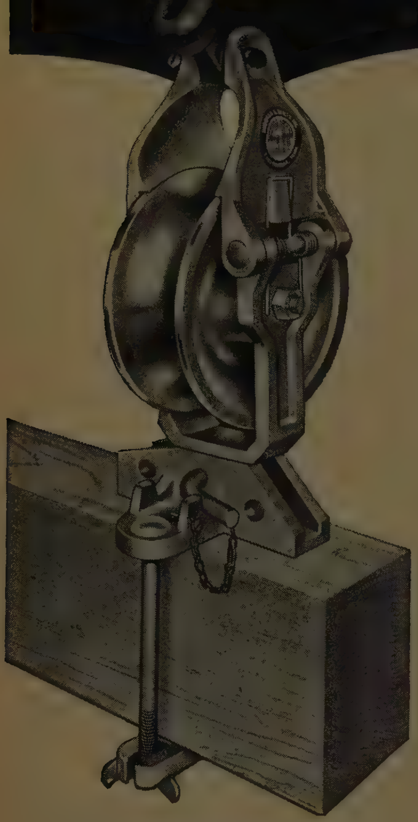
S&R Universal Stringing Sheave

MODEL XS-100



USE on CROSSARM as shown

USE on ANGLE for cornering block

USE without BRACKET to suspend from insulator stringing

Light weight, adjustable bracket, tough aluminum alloy throughout, safety locking, wide throat and anti-friction bearings. Grooved for cable through 1 ¾" diameter. Designed especially for ACSR.

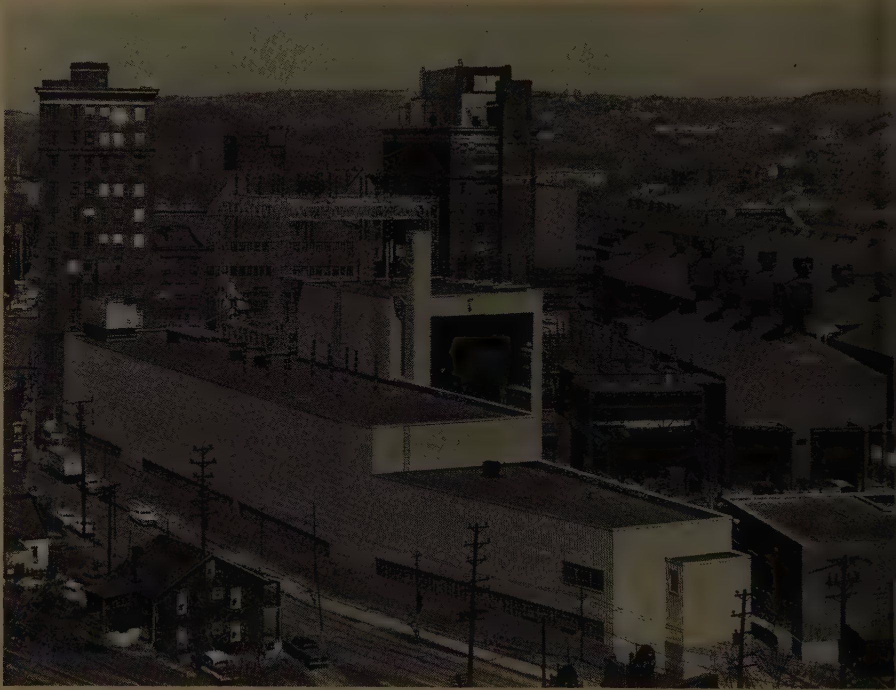
NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
CHATTANOOGA 2, TENNESSEE
Telephone AMherst 7-1273
TWX CT-7036

Westinghouse Installing High Power Test Eqiupment

Westinghouse Electric's capacity for subjecting circuit breakers, switchgear, and related apparatus to full-scale short-circuit test conditions is being increased by the construction of a third major test facility in East Pittsburgh, Pa. To become operational in 1962 as Station No. 3 at the high power laboratories, it will be used both as an independent facility or in parallel with Station No. 2. Paralleling the two stations will permit full power tests on circuit breakers in ratings up to 7500 mva.

Station No. 3 will add two test cells to the six that are now available at this lab. Largest of the new cells has a 5000 sq ft area and is 80 ft high—claimed to be the electrical industry's largest covered test cell. The second cell is designed for testing at generator voltage (16.5 kv) and is much smaller.



In the foreground is the complex of structures making up the Westinghouse high power laboratory. At the center is the test cell provided with elevator service to the roof. The longer building will house the generator room, service area reactor and capacitor banks, and laboratory facilities.

Square D Sells Product Line To Sierra

Square D has sold the manufacturing rights, tools and inventories for its low-voltage lighting control system to Sierra Electric Corp., Lawrence G. Maechtlen, president of Square D, announced.

All manufacturing equipment for the low-voltage control system will be moved from the Square D facility at Cedar Rapids, Iowa to the Sierra factory at Gardena, Calif. A target date of July 1, 1961 was set for complete take-over by Sierra.

First Alaskan Pressure-Treating Plant

Pressure-treated wood is being produced for the first time in the State of Alaska with the operation of their new wood-preserving plant, Koppers Co., Inc., announced. The Whittier plant which started operating last month, is equipped to pressure-treat ties, poles, piling and lumber.

Initially, the treatments used will impregnate the wood with creosote. Shortly, however, the plant will also produce NON-COM fire-pro ected wood. The NON-COM treat- ient is comparatively new, but it as been given the Underwriters aboratories' approval, according to oppers.

Major customers for the produc- on of the new Whittier plant will e a dozen publicly-owned utilities, ne Alaska Railroad and the Co- umbia Lumber Co., whose plant is earby. Steam for operation of the oppers plant is being obtained om Columbia Lumber.

oncrete Drilling Service

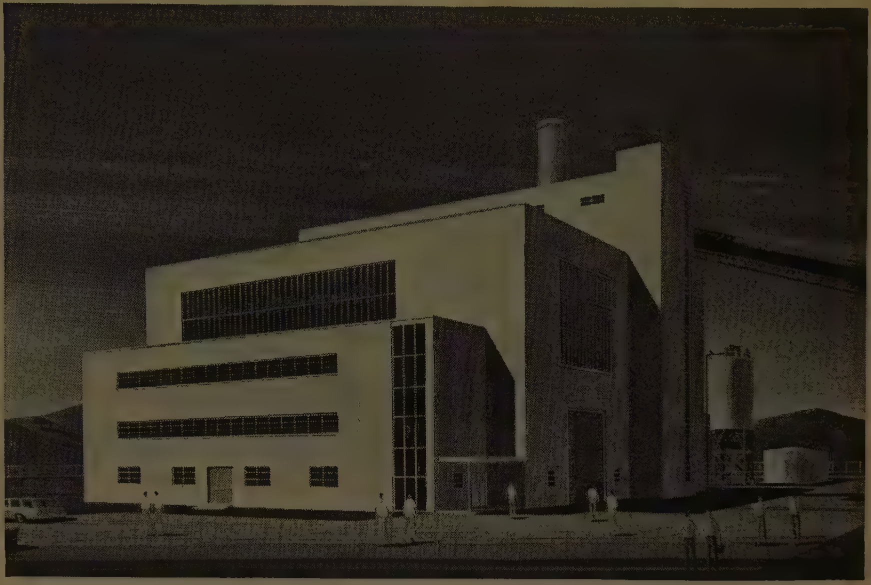
The GEO-Drill Co. now offers an ndustrial drilling service for holes om ¼ in. to 20 in. diameter thru einforced concrete and all other asonry materials. This service is esigned to meet the needs of plant aintenance and construction de- artments for the installation of lectrical conduit, pipe, thermocou- les, anchor bolts and etc. as well s larger openings for doors and uct.

is 9-in. diameter hole was drilled through a inforced concrete wall with diamond-bit illing machine.

Sales Briefs

Leeds & Northrup Co. announces e opening of a new office in Bir- ingham, Ala., to serve Alabama, ississippi and parts of Tennessee d Florida. **Leeds & Northrup** says is is its forty-first U. S. office; it

POWER



BY DESIGN

Thermal, hydro electric, nuclear or internal combustion . . . Kuljian engineers are specialists in the design and development of modern power facilities.

Over 30 years' experience in the power field can be focused on every phase of your new project or expansion program. Write for brochure detailing specialized Kuljian services for industry and utilities.

ADDITIONAL KULJIAN SERVICES

Surveys • Investigations • Reports
Transmission and Distribution Lines
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The Kuljian Corporation
engineers • constructors

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DESIGN • ENGINEERING • PROCUREMENT • CONSTRUCTION • REPORTS

OVER 1,000,000 KVA IN SERVICE

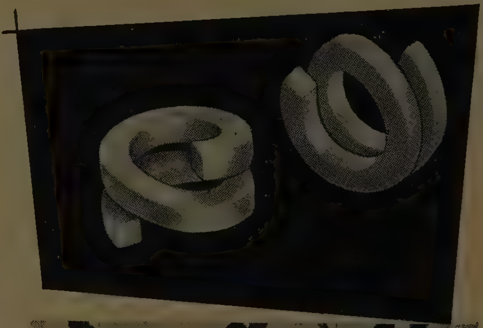
A DELTA GROUNDED TRANSFORMER
SAVES SPACE AND MONEY
when both the high voltage and low voltage require a neutral ground

Correspondence invited if you desire additional descriptive matter, have any questions or desire recommendations for a specific problem.

H. L. HOEPPNER
Park Ridge, Ill.
211 Imperial St.

"Give me lock washers that will stay put!"

Specify **EATON-RELIANCE**
DOUBLE COIL Pole line Washers



The Eaton-Reliance Thackeray Spring Washer was engineered specifically for pole-line usage where there is vibration and stress. Because of their greater reactive range, these DOUBLE COIL HELICAL SPRING WASHERS are specified daily by power line and communications engineers throughout the nation, and are paying off in reduced line maintenance costs because of longer washer life. Remember—the failure of a single spring washer could result in the failure of an entire transmission line. These rugged spring washers provide an extra margin of protection against failure. Write for specifications.

Reliance EATON® Division
EATON
MANUFACTURING COMPANY
508 Charles Ave., S.E. • Massillon, Ohio

Sales Offices in Principal Cities from Coast to Coast

PRINTED IN U.S.A.

also has subsidiaries or agents in about 25 other countries.

Combination of the engineering and marketing function at G-E's **High Voltage Specialty Transformer Section**, Holyoke, Mass., has been announced by section general manager, **Max I. Alimansky. Gene E. Lewis** has been appointed manager of marketing and engineering.

The establishment of a Western Regional Sales Office in San Francisco, Calif., was announced by **C. H. Wheeler Manufacturing Co. Elbert E. Baker**, vice president of the company, has been appointed to direct the region's operations and also assist with West Coast sales activities of **Wheeler's** affiliate, **The Griscom-Russell Co.** The new office will serve customers in California, Washington, Oregon, Arizona, New Mexico, Idaho, Wyoming, Nevada, Montana, Utah and Colorado.

Appointment of **Transmission Equipment Co.** as new distributor for **Ohio Gear Co.** in the Pittsburgh area was announced by **Byron G. Elton**, Manager, Distribution Sales.

Besides stocking **Ohio Gear's** full line of gears and speed reducers, **Transmission Equipment** is exclusive local agent for **Dodge Mfg. Corp.; Falk Corp.; Chain Belt Co.; Warner Electric Brake & Clutch Co.; Aeroquip;** and **U. S. Electrical Motors, Inc.,** according to president **Nelson White.**

Computer Measurements Co. has announced the appointment of **Atlas Instrument Corporation, Ltd.** to represent the Sylmar, California manufacturer of solid state and vacuum tube digital instrumentation. **Atlas Instrument Corp.** located in Toronto, will represent **CMC** throughout Canada.

Hubbard and Co. is moving its Executive Offices from 200 So. Michigan Ave. to its factory location at 5401 W. Roosevelt Road Chicago 50, Ill.

Several new sales representatives have been appointed by **Times Wire & Cable,** division of the **International Silver Co.,** as part of a program for expanded distribution of their products.

INTRODUCING THE NEW

DRYDEN-EAST HOTEL

39th St., East of Lexington Ave.

NEW YORK

Salon-size rooms • Terraces • New appointments, newly decorated • New 21" color TV • FM radio • New controlled air conditioning • New extension phones in bathroom • New private cocktail bar • Choice East Side, midtown area • A new concept of service. Prompt, pleasant, unobtrusive.

Single $15 to $22   Suites to $60
Special rates by the month or lease

Robert Sarason, General Manager

ORegon 9-3900
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GOODBYE PEST BIRDS!

Pest birds build nests in substation transformers, insulators and radiators where, when nests become wet, "shorts" can cause costly damage to equipment and loss of valuable customer good will. Cleaning up after the birds is no fun.

Let Rid-A-Bird Help You

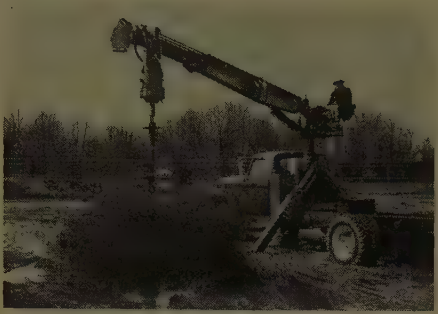
RID-A-BIRD is a simple, efficient system that insures permanent removal of pest birds from substations. No awkward, complicated devices or equipment to install. The Rid-A-Bird System is successfully at work for businesses throughout the nation. It will enable you to watch your pest bird problems fly away. Mail coupon today.

RID-A-BIRD INC., P. O. Box 22, Dept. EL-2
Muscatine, Iowa
Send descriptive literature and prices.

NAME ____________________
ADDRESS ____________________
CITY ____________ STATE ____________

New Product Design

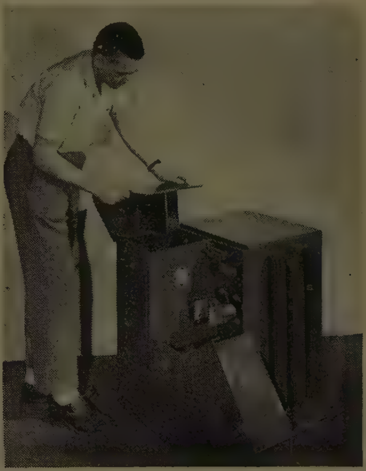
Center-Mounted Derrick



A center-mounted derrick by **Holan Corporation** can be operated from a rotating crow's-nest. The firm points out that the operator has an unobstructed view of his work area, and can dig, "live boom" up to 9,000 pounds, rotate 360 degrees in either direction and extend and retract the seven-foot boom. Foot pedal controls rotate the derrick and operate the digger. The derrick vertical movement and boom extension and retraction operations are controlled by hand levers.

Circle item #1 on reply card

Compact Transformers



Low-profile, single-phase, residential transformers (type SMRT) by **Allis-Chalmers** are engineered for safety, and installation, operation and maintenance ease. The new line of surface-mounted transformers is available in sizes 25 through 50 kva, 15 kv and below with a 240/120 secondary rating.

One third smaller and lighter

Searching for Meter Sockets?

look to . . .

SUPERIOR SWITCHBOARD & DEVICES CO.

CANTON 1, OHIO
A Subsidiary of
The Union Metal Manufacturing Co.

Drawn Ringless Socket

Write for a free Catalog outlining types and sizes of meter socket equipment, test switches, test blocks, reactiformers and enclosures.

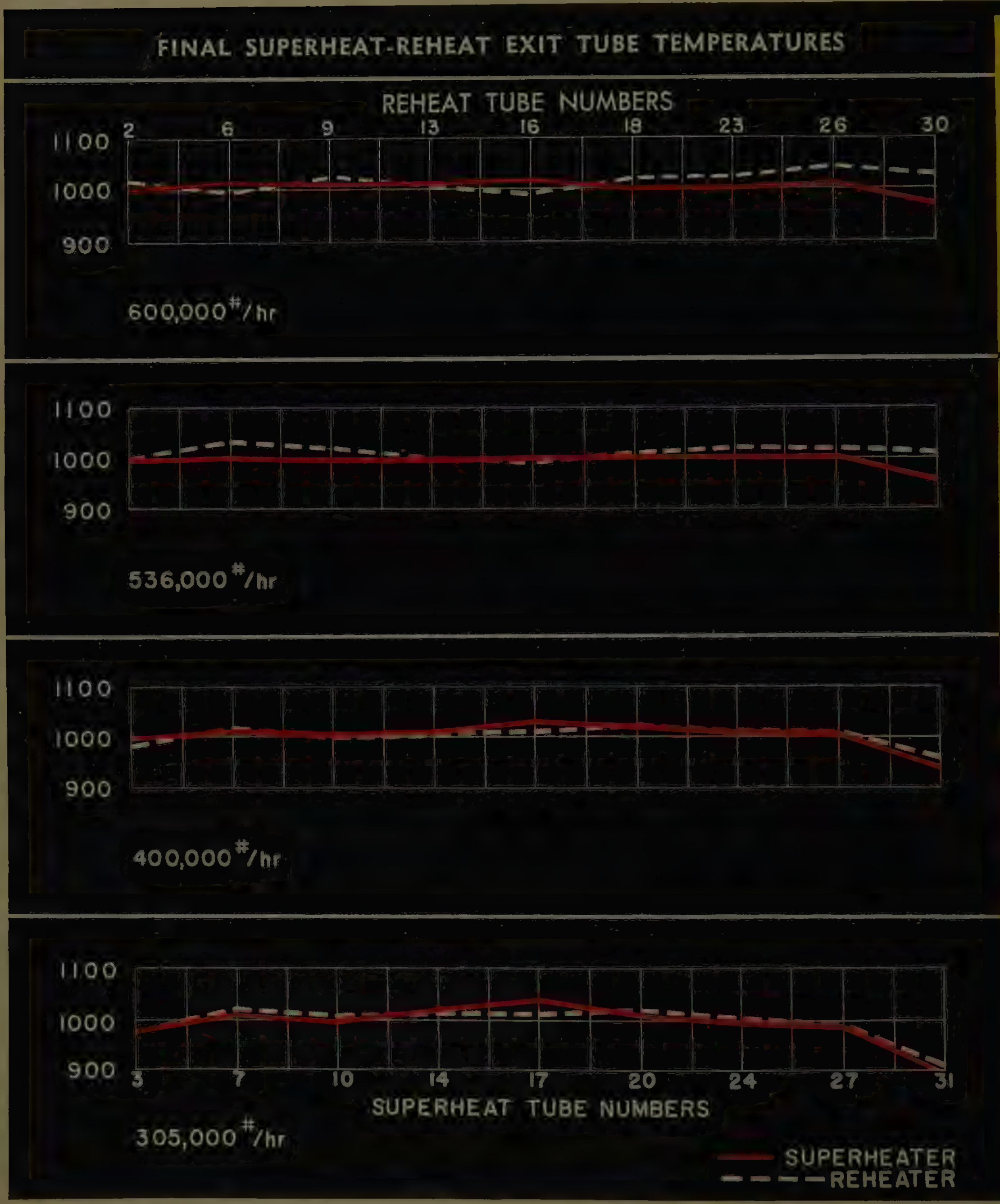
FLORIDA POWER CORPORATION'S TURNER STATION

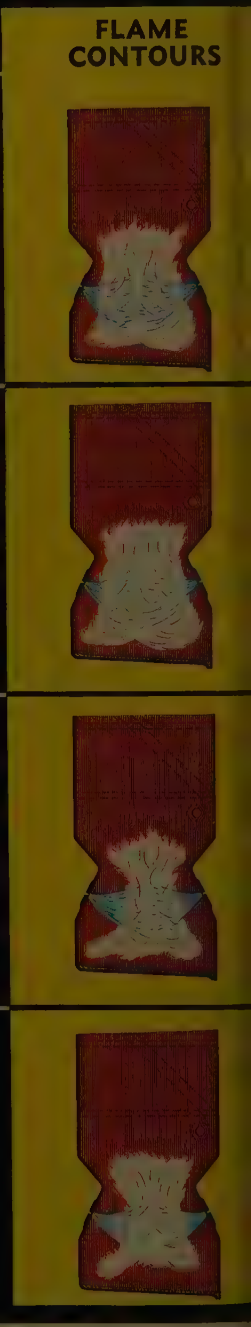
Enterprise, Florida

Unit No. 4 is a 600/000 lb/hr
RILEY TURBO FURNACE BOILER

Design Pressure — 1750 psig
Superheat/Reheat — 1000°F
Fired by Natural Gas and Oil
Efficiency up to 90% on oil — 86% on gas.

BLACK & VEATCH
Consulting Engineers


FINAL SUPERHEAT-REHEAT EXIT TUBE TEMPERATURES

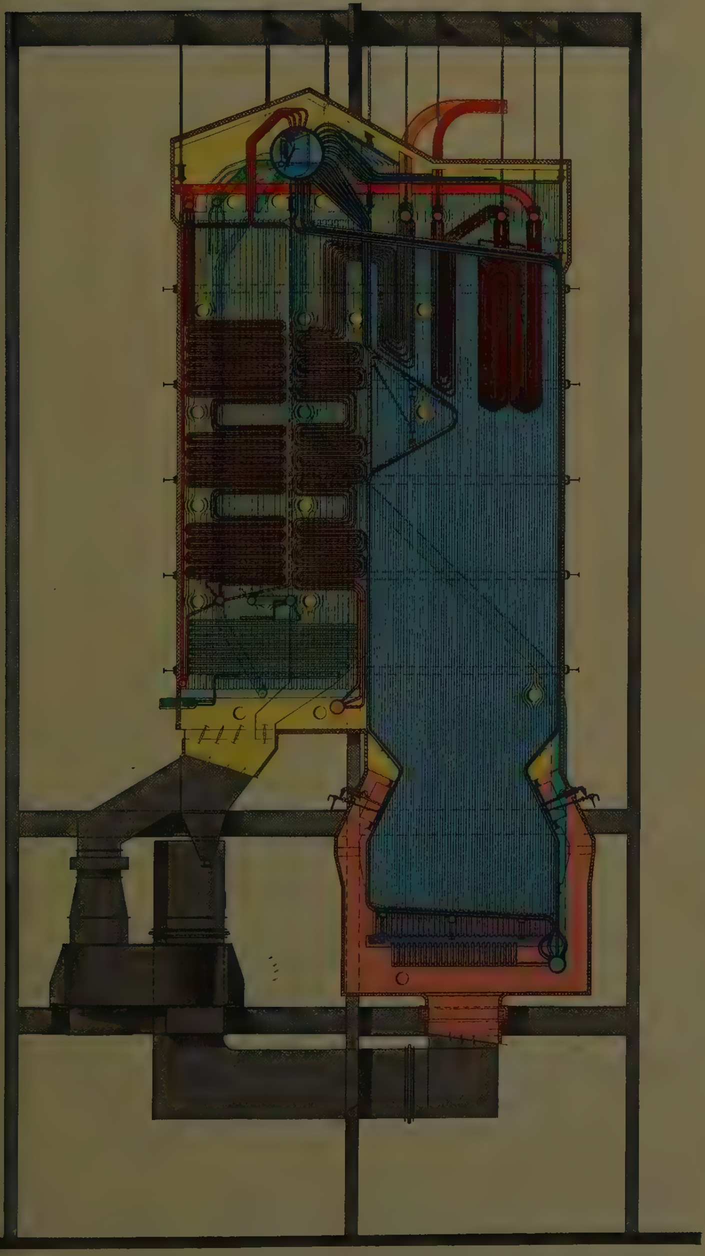

FLAME CONTOURS

RILEY TURBO FURNACE

produces extremely uniform furnace exit temperature at

FLORIDA POWER CORPORATION

Uniform, safe gas temperatures across the full span of a boiler's high temperature superheater and reheater is a vital requirement for trouble-free operation. With a Riley Turbo Furnace this objective is attained . . . without use of costly auxiliary methods for distributing furnace gas.



In the Riley Turbo Furnace all fuels — gas, oil, coal — are burned at the base of the furnace well away from superheater and reheater with combustion taking place evenly from side wall to side wall. Combustion gas rises within the furnace envelope in a uniform side wall to side wall column resulting in minimum variation in metal skin temperatures of all superheater and reheater elements. Temperatures are well within safe alloy limits to assure long tube life. Proof of such performance is provided in the accompanying curves. Flame contour diagrams illustrate combustion uniformity at each load level.

The Turbo Furnace boiler is capable of operating over a 6-1 load range with oil or gas firing with all burners in service on automatic control and without burner adjustment. Design and operating characteristics of the Turbo Furnace also provide more rapid and uniform water and steam circulation, help to maintain a clean furnace, and minimize flyash and air pollution problems.

RILEY

STEAM GENERATING AND
FUEL BURNING EQUIPMENT

RILEY STOKER CORPORATION
WORCESTER, MASSACHUSETTS

SALES OFFICES:
Boston, Charlotte, Chicago, Cincinnati, Cleveland, Denver, Detroit, Honolulu, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, St. Louis, St. Paul, Seattle, Syracuse.

ANOTHER CORVEL® SUCCESS STORY

Perennially, warm pole transformers make snug roosts for varmints...and trouble for utilities. Serious outages used to occur when squirrels and birds bridged the terminals to the steel tanks.

Atmospheric corrosion and wear was another headache: salt fogs along the coasts; abrasive sand storms in the southwest; big city smog. All took their toll. Steel transformers often required expensive maintenance or replacement *every year.*

CORVEL Fusion-Bonded Coatings, applied by a revolutionary new coating technique, were the economical answer to the outage problem. As an unexpected extra benefit, they solved the corrosion and maintenance problems too.

The savings in maintenance alone persuaded one manufacturer to use CORVEL coatings, not only for transformer covers, but for transformer cases and other hardware where maintenance means money.

THE COATING PROCESS

On production lines, rough finished transformer covers and pole line hardware are heated and then dipped into a *dry* fluidized bed of CORVEL Fusion-Bond powders. Resin particles fuse evenly over all surfaces of the parts which are then removed and briefly post-heated. This causes the sintered powders to melt and flow together into a glossy, uniform film with excellent edge coverage. The result is a tough, durable finish that insulates and "weathers" for years.

For complete information about CORVEL Fusion-Bonded Coatings for pole line equipment write today.

POLYPENCO®

THE POLYMER CORPORATION
Whirlclad Division • Reading, Pa.
Engineered Industrial Plastics
STOCK SHAPES • SINTERED PARTS • MOLDING RESINS • CORVEL® COATINGS

than existing units, the 50-kva unit weighs only 750 lbs complete, according to the firm. Its one-size 28½-inch high tank and removable cable compartment accommodates all kva and voltage combinations, the company says. The transformer occupies a three-foot square area.

The transformer's entire cable compartment can be removed for easy cable installation and maintenance. Its compartment, says the manufacturer, is completely tamper-proof.

Circle item #2 on reply card

Meter Carrying Case

Carrying case for regular, demand, and clock type glass covered socket type electric watthour meters by **Wornstaff Tools Inc.** holds three meters and prevents damage by a closed lid holding the meters on a foam rubber cushion. The carrying case can also be used as step for installing or removing meters.

Circle item #3 on reply card

Improved VAR Control

An improved var control (CJ-7) for switching capacitors, available in two styles from **Westinghouse Electric Corp.,** has controls adjustable from 250 vars leading to

500 vars lagging. One style for "wye" control systems has zero torque when voltage and current are in phase. The other for "delta" systems has zero torque when voltage leads current by 30 degrees. The two contact settings, the firm says, are independently adjustable through the entire range providing the band spread between them is greater than the change produced by switching the capacitors.

Circle item #4 on reply card

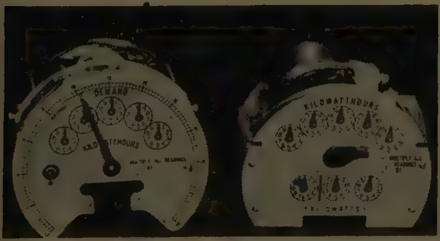
Noise Suppressor For Two-Way Mobile Radios

Motorola has announced a means of suppressing ignition noise interference in two-way, mobile radio systems. Known as "Extender" operation, the device, according to the company, eliminates impulse interference from the radio-equipped vehicle and all other vehicles in the vicinity thereby allowing greater operating range and more reliable radio reception in heavy traffic.

An added feature of the new "Extender" model radios, the company says, is the rejection of intermodulation and desensitization—forms of interference that may be generated by strong signals of transmitters in specific areas.

Circle item #5 on reply card

New Demand Register



New, dial-type reading demand registers by **General Electric Company's Meter Department** have a

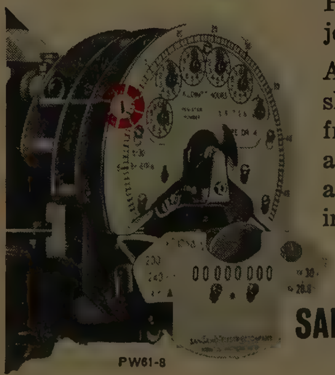
with Sangamo Dual Range Mechanical Demand Registers

Sangamo DR registers improve metering accuracy, keep pace with load growth, reduce register changeouts, and cut inventory costs by reducing the number of meters and registers you need to stock.

The Sangamo dual range (DR) mechanical register has a "flip-over" scale plate that permits rapid in-the-field range changes while assuring positive interlock between scale and range selected. It is available for singlephase and polyphase watthour meters in both universal and standard scales.

A range change is accomplished by simply loosening (not removing) six screws and reversing the scale plate. Only one gear moves, and the register does not require readjustment after the change---accuracy is always ±1% of full scale. Polished, hardened stainless steel pivots and jeweled bearings maintain the high accuracy.

And in the DR, you can rely upon the Type H slow speed, high torque motor to remain trouble free. Sangamo's gravity reset action further assures dependable, maintenance-free performance. Your Sangamo Representative has other important information about the DR.



SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PW61-8

The GenTex Safety Hat . . . your way of looking out for yourself on the job. With an impact resistance of better than 40 foot-pounds and a penetration resistance of less than ¼", the GenTex is the hard hat with heart. So when someone up above shouts "Headache," let a GenTex Safety Hat do **your** talking. From the GenTex Corporation, 450 7th Ave., New York 1.

write for
full details

timing motor with maintenance-free life of 25 years, the company says. Incorporating unlimited-capacity, the demand register (type M-60) combines the usable capacity of a class six register with the accuracy and readability of a class one register, according to the firm. The M-60, it is said, can record the entire range of possible loads in contrast with sweep-hand registers that require multiple scale-plate changings to register increasing loads.

Circle item #6 on reply card

Protective Enclosures For K-Don Breakers

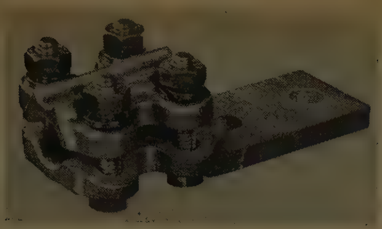
Individual enclosures by **I-T-E Circuit Breaker Co.** for its new line of K-Don circuit breakers afford, the company says, such benefits as large and accessible cable make-up area; ease of trip unit adjustment, general maintenance and service; drawout operation; and visible break disconnect contacts. Compact internal arrangement of breaker components, it is said, has permitted an enclosure which provides ample room and accessibility for cable make-up, with extra room for cable one size larger than previously permitted in similar enclosed breakers of comparable ratings.

Circle item #7 on reply card

Notice of Correction

The headline, "Blasts Faults In Less Than Two Seconds," which appeared in the Engineering-Operations section of the June 1 issue, page 33, should have read "Blasts Faults In Less Than Two Cycles".

RAR Terminal Lugs

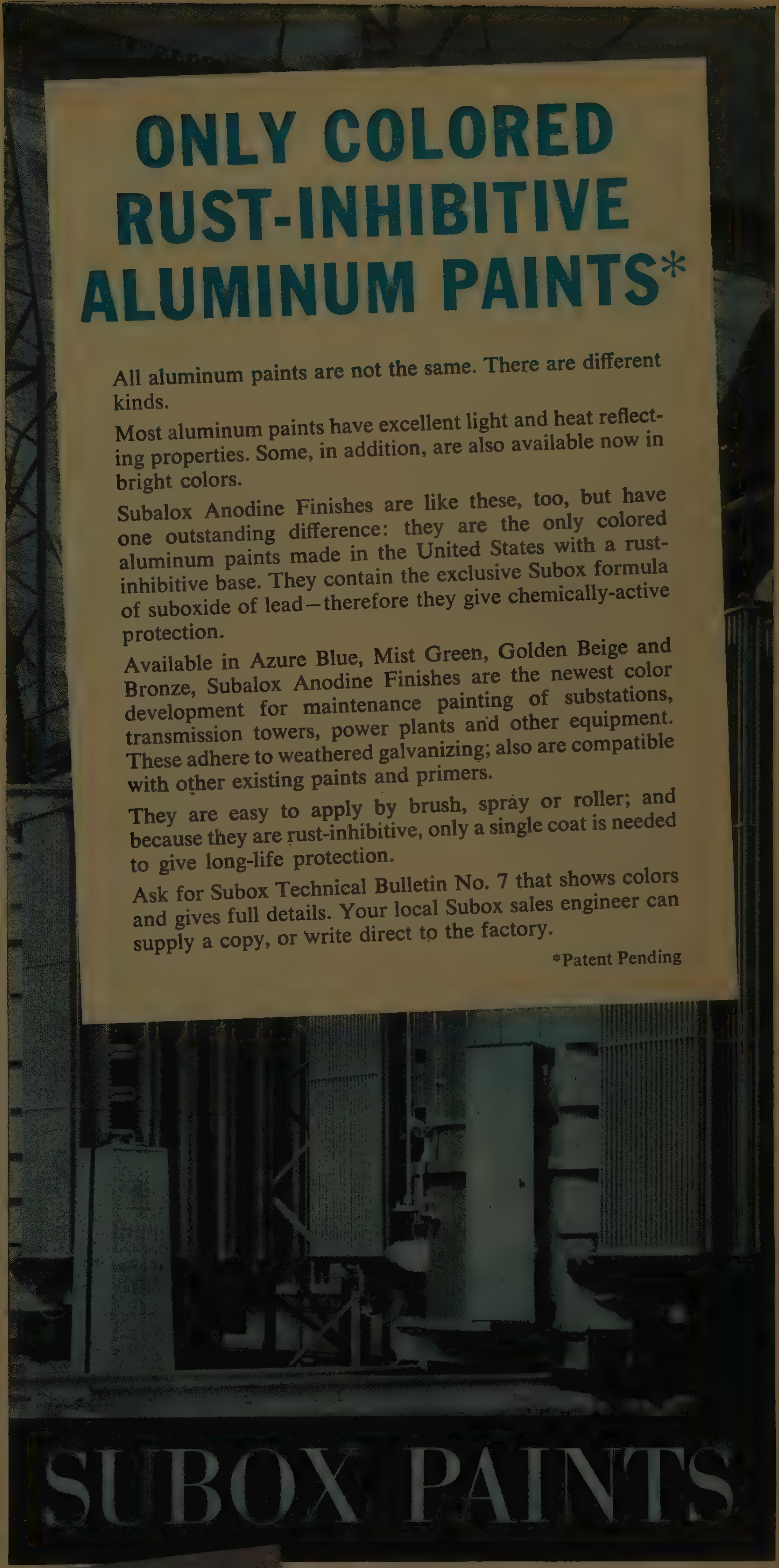


Bronze RAR terminal lugs by **Penn-Union Electric Corp.** feature wide-range, reversible caps of high strength, and a four-bolt clamping design on all sizes. Bolts are made of silicon bronze and a choice is given of one, two or four hole NEMA tongues. An additional selection of straight, 45 degree or 90 degree angle tongue is available. The reversible cap feature, the firm says, requires only five RAR terminal lugs to cover the application of any cable size from number eight solid through 2,000,000 stranded copper conductor.

Circle item #8 on reply card

Uprated Disconnect Switches

Continuous current ratings of "Loadbuster" disconnect switches have been raised from 400 amp to 600 amp, according to **S&C Electric Co.** All "Loadbuster" disconnect switches now in service use silver-weld contact construction which provides the 600 amp continuous-current rating. This new rating basis provides an overload capability on all 400-amp units now in service, and allows for future system growth. The 15-kv "Loadbuster" disconnect switches come in 95-kv and 110-kv BIL ratings to cover most distribution system applications. Silver-weld contact construction makes possible short-time ratings of 25,000 amp (momentary)



ONLY COLORED RUST-INHIBITIVE ALUMINUM PAINTS*

All aluminum paints are not the same. There are different kinds.

Most aluminum paints have excellent light and heat reflecting properties. Some, in addition, are also available now in bright colors.

Subalox Anodine Finishes are like these, too, but have one outstanding difference: they are the only colored aluminum paints made in the United States with a rust-inhibitive base. They contain the exclusive Subox formula of suboxide of lead—therefore they give chemically-active protection.

Available in Azure Blue, Mist Green, Golden Beige and Bronze, Subalox Anodine Finishes are the newest color development for maintenance painting of substations, transmission towers, power plants and other equipment. These adhere to weathered galvanizing; also are compatible with other existing paints and primers.

They are easy to apply by brush, spray or roller; and because they are rust-inhibitive, only a single coat is needed to give long-life protection.

Ask for Subox Technical Bulletin No. 7 that shows colors and gives full details. Your local Subox sales engineer can supply a copy, or write direct to the factory.

*Patent Pending

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and 16,000 amp (four-second) by eliminating pitting and burning at contact surfaces at high current levels, the company states.

Circle item #9 on reply card

Dead-End Assembly

Dead-end assembly by **Pinco Division of the Joslyn Mfg. and Supply Co.** is designed for grading the voltage impressed on the insulator string and reducing the radio noise influence of the line. The company says it has pioneered many designs.

Circle item #10 on reply card

EFFECTS OF 65° RISE . . .

(Continued from page 67)

Loading is limited, however, by thermal endurance of insulation, voltage drop, and cost of losses. Improvements in the design of conventional transformers have substantially relieved the first two limitations. The HL-65 transformer, with its low loss ratio, INSULDUR insulation, and high-temperature oil, is designed for heavy loading and should effect substantial savings on most systems. Other solutions to the problem, notably the 55/65-rated transformer, seem to be much less satisfactory.

Heavier loading requires more accurate and reliable load monitoring. Because they are coordinated with the transformer's economic load capability, and respond to unforeseen load conditions automatically, thermal load indicators or the signal lights on protected transformers appear to offer the most satisfactory method of monitoring.

REFERENCES

(1) The American Standard Guide for Loading Oil-Immersed Distribution and Power Transformers, ASA C57.92.

(2) Functional Life Testing of Distribution Transformers—Its Effect on Operating Economy, A. M. Lockie. AIEE CP 60-1169.

(3) Cost of Electric Distribution Losses, H. F. Hoebel. Electric Light and Power, March 15, 1959, pp. 52-55.

(4) New Transformer Design Offers Substantial Savings. W. H.

"Joe, we plan to specify Anderson products on that new transmission line..."

"Anderson? What changed your mind?"

Johnson and W. E. Mekolites, Electric Light and Power, May 15, 1961.
(5) The Effect of Loading and Loss Ratio on the Cost of Losses in Distribution Transformers, A. M. Lockie. AIEE CP 60-556.

ALUMINIZED STEEL

(Continued from page 61)

pound A to the core wires did not close the gap in performance between the two core wires. In other words, aluminized core wire was still markedly more resistant to attack than hot-dipped galvanized core wire with or without Compound A, (see Fig. 6).

Summary

As indicated by accelerated laboratory corrosion tests, and exemplified by the service-like exposure at P.G. & E.'s Jenner Test Site, No. 2 ACSR 6/1 containing aluminized steel core wire was found to be considerably more resistant to corrosion than similar conductor containing either hot-dipped galvanized, electrogalvanized, or grease protected hot dipped galvanized core wire.

References

(1) E. W. Greenfield and E. W. Everhart A Field Study of ACSR Cable in Severe Marine and Industrial Environment. *Power Apparatus and Systems,* No. 29, 106-117, (April, 1957)
(2) E. T. Englehart and K. J. Brondyke Resistance to Corrosion of Aluminum Coated Steel Wire *Wire and Wire Products,* 33, No. 11, 1365-1367, 1370-1372, 1404, 1405 (November, 1958)
(3) C. J. Walton, D. O. Sprowls, J. A. Nock, Jr. Resistance of Aluminum Alloys to Weathering *Corrosion,* 9, No. 10, 345-358 (October, 1953)
(4) C. J. Walton and W. King. Resistance of Aluminum-Base Alloys to 20-Year Atmospheric Exposure, Symposium on Atmospheric Corrosion of Non-Ferrous Metals, ASTM Special Technical Publication No. 175, 21-46 (1955)

"Well, we tested 'em . . . Anderson clamps outperformed all others. And you know, of course, Anderson's facilities are self-sufficient . . . and they're constantly coming up with new improvements . . ."

"Suits me! Anderson sure has the design, quality, service . . . and the competitive price we want, too!"

Research/ Quality/ Performance/ in Aluminum and Bronze Products

ANDERSON ELECTRIC
CORPORATION
BIRMINGHAM, ALABAMA

NEW
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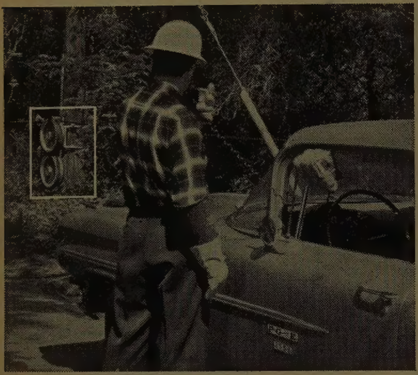
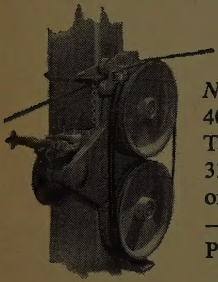
TENSIONER





Now...PENGO
4000 Tensioner
Takes Conductor to
336,500 cm-ACSR
or 397,500 cm-AAC
—Tensions to 1,000
Pounds!

Here's a bullwheel tensioner you can carry in every line truck! It features two 18 inch neoprene lined bullwheels. Tru-Stop disc brake — yet weighs so little it's truly portable.

Two men can easily place the 4000 PM against the pole, attach it (chains and wing-nut tightener are permanently attached to tensioner), and start stringing in a matter of minutes. Conductor can be payed off any suitable reel stand. A collapsible reel attached to a winch shaft makes a practical puller, although any type of power previously used for pulling can be used.

TENSION WIRE STRINGING is the safe, economical modern way to string distribution and transmission lines. Why not get the facts? Write for new PENGO catalog TSE-1 for full data on the world's largest, most complete line of tension stringing equipment. Please address Dept. 28.

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B-15

MEN OF POWER

Anderson

Arthur N. Anderson, formerly assistant vice president, was elected vice president Consolidated Edison Company of New York. He will have responsibility for the company's construction activity in the streets and for transportation throughout its service area with the exception of Staten Island.

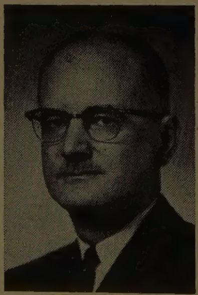
For the past decade Mr. Anderson has been associated with many activities which ultimately led to the construction of Consolidated Edison's atomic power plant now nearing completion at Buchanan, New York.

On leave from the Company in 1951, he served as a power engineer for the Atomic Energy Commission in the Reactor Development Division. Later, the company assigned him to Atom Power Development Associates, a nuclear study group working toward the development of a large-scale advanced reactor. Mr. Anderson joined Consolidated Edison in 1933.

* * *

Elected Vice President of Mississippi Power & Light Company is former General Sales Manager, **J. J. Powell.** He joined the company only three years after its organization in 1926, and helped establish the sales department.

* * *



Stoddart

J. E. Stoddart, Northern States Power Company general sales manager, has been elected vice president in charge of marketing, and will head sales of commercial, industrial, and residential electricity as well as merchandise sales activities and the company's home service department.

Since joining the company in 1934, he has held various offices including sales manager of the Sioux Falls division, and sales manager of the St. Paul division; he was named sales manager in 1960.

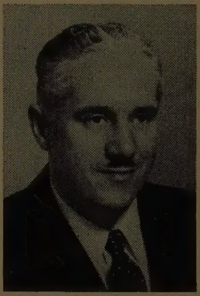
* * *

Elected Vice President in charge of operations of Houston Lighting & Power Company is **Karl K. Kreamer,** assistant vice president since 1956. During World War II and the Korean War, he was the company's representative in Washington, D. C

* * *

Former General Sales Manager **Charles J. Sinnott** has been elected vice president of New Orleans Public Service, Inc. After starting with the company in 1937 as a commercial sales representative, he transferred to the residential division and became a group supervisor.

* * *



White

William H. White, formerly executive vice president, has been elected president and treasurer o A. B. Chance Co of Canada, Ltd He has served as executive vice president since the company was organized in 1955, and has been active in the Canadian Electrical industry for more than 20 years. Former Sales Manager o the firm, **Robert T. James** has been appointed vice president in charge of sales. **Nixon Berry,** Toronto attorney, was elected a director of the company.

* * *

Martin E. Juhl, president and general manager of the Lake Superior District Power Co., was recently installed as chairman of the board and president of the Wisconsin Utilities Association. In addition to his varied committee service, he is a past chairman of the Electric Operating Section of the Association.

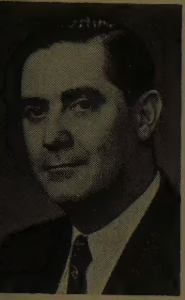
* * *

Small Air Circuit Breaker division of I-T-E Circuit Breaker Com

any has named **Carl Edward**
ryctko as manager of engineer-
ng. He was former head of Small
ir division's test laboratory and
ater named to head its develop-
ent program.

* * *

Former Assistant Vice President,
Villiam C. Beattie has been elected vice president, Consolidated Edison of New York. He will have responsibility for the company's electric, gas and steam production facilities.


Beattie

In 1927 he joined the operating
epartment of Brooklyn Edison
ompany, since merged into Con-
olidated Edison. He has worked in
hree of the system's electric gen-
rating stations, headed the me-
hanical construction bureau, later
ecoming superintendent of the
ervice bureau.

He returned to production as
anager in 1954, responsible for
e operation of all electric, steam
nd gas plants.

* * *

Men of Power Briefs

John D. Carver, former assistant
the vice president of operations
Cia. Auxiliar de Empresas Elec-
ricas Brasileiras, has been ap-
ointed General Manager of Cia.
acional de Fuerza y Luz of Costa
ica.

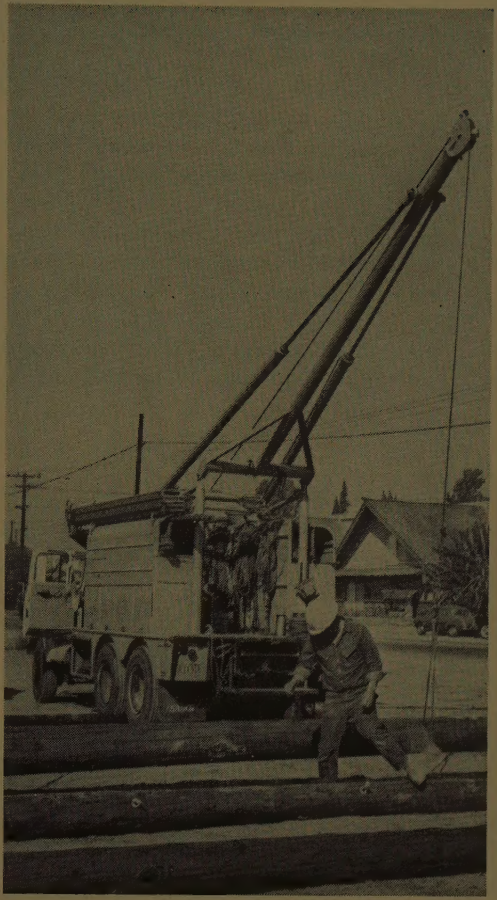
Former Nuclear Project Engi-
eer, **Raymond D. Welch** has been
romoted to assistant general en-
ineer of Tampa Electric Company.

Appointment of **James L. Went-**
orth as purchasing agent, elec-
ical products, has been announced
the purchasing section of the
dustries Group at Allis-Chalmers
est Allis Works.

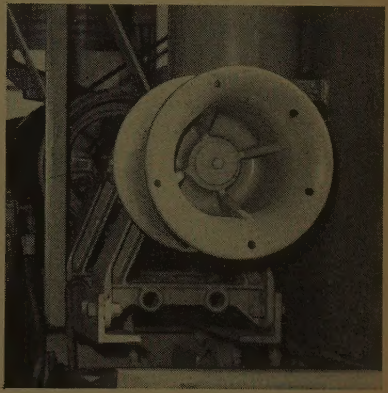
Reynolds Metal Company has
amed **Roy H. Hainsworth** assistant
the director of electrical market
les.

Charles S. Martin has been ap-
ointed midwestern sales manager
General Electric's Insulating Ma-
rials Department.

TULSA®



This International R-190 truck uses a model 34 Tulsa Winch operating with a hydraulic boom. The truck is one of the 2,850 vehicles used by the Southern California Edison Company to service more than 20,000 square miles in the Southern California area.



strength & stamina that spell savings

There's more room for pay load because a Tulsa Winch is compactly designed. This winch packs a terrific pull even though weight has been trimmed to the bone. More shock load is absorbed, and more operating efficiency is delivered by Tulsa's specially designed worm and gear. You have less engine wear and lower fuel bills since you use less horsepower to move a given load. Longer life for cable or wire is provided by a larger size and machined drum barrel.

Tulsa's easily installed front mounted winches assure better weight distribution and steering for the vehicle — and safer off-highway operation — because there's a minimum of overhang.

WRITE for special Public Utility bulletin CUV-58.

TULSA PRODUCTS DIVISION
VICKERS INCORPORATED, DIVISION OF SPERRY RAND CORPORATION
731 EAST 1ST ST. TULSA, OKLAHOMA
E-403

CALENDAR OF EVENTS

July 18-20—Western Plant Maintenance & Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

July 25-Aug. 10—1961 Chicago International Trade Fair, McCormick Place, Chicago, Ill.

Aug. 7-11—Western Resources Conference, Colorado State University, Ft. Collins, Colo.

Aug. 16-18—APPA Accounting and Finance Workshop, Ambassador Hotel, Los Angeles, Calif.

Aug. 23-25 — AIEE Pacific General Meeting, Hotel Utah, Salt Lake City, Utah.

Sept. 6-8—AIEE-IRE-ISA Joint Nuclear Instrumentation Conference, North Carolina State College, Raleigh, N. C.

Sept. 10-13—Rocky Mountain Electric League Fall Convention, Jackson Lake Lodge, Moran, Wyo.

Sept. 12-14—Eastern Wood Pole Conference, Syracuse University, Syracuse, N. Y.

Sept. 14-15—AIEE-ASME Engineering Management Conference, Hotel Roosevelt, New York, N. Y.

Sept. 20-21—P.I.P. Workshop Conference, Brown Palace Hotel, Denver, Colo.

Sept. 20-22—NELPA Annual Business Meeting, Sheraton-Portland Hotel, Portland, Ore.

Sept. 24-29—National Technical Conference, Hotel Chase-Park Plaza, St. Louis, Mo.

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